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Canadian Science Advisory Secretariat
Maritimes Region **Science Response 2022/011**

STOCK STATUS UPDATE OF LOBSTER (*HOMARUS AMERICANUS*) IN LOBSTER FISHING AREA 41 (4X + 5ZE) FOR 2021

Context

The status of American Lobster (*Homarus americanus*) in Lobster Fishing Area (LFA) 41 was last assessed in the fall of 2017 (DFO 2018; Cook et al. 2017) with annual updates in the following years (DFO 2019, DFO 2020a, DFO 2021). This update applies the suite of indicators from the 2017 assessment to determine the stock status for the 2021 fishing season. The Northeast Fisheries Science Centre (NEFSC) surveys were not conducted in 2020, and the at-sea observer companies were restricted, or limited, in their operations due to the COVID-19 global pandemic resulting in missing or limited data in 2020. The survey data and bycatch information were updated where possible. Indicators for Lobster in LFA 41 are consistent with the Fisheries and Oceans Canada (DFO) precautionary approach and allow for the evaluation and monitoring of the offshore Lobster fishery.

This Science Response Report results from the Regional Science Response Process of October 22, 2021, on the Stock Status Update of American Lobster in Lobster Fishing Area (LFA) 41.

Background

Description of the fishery

Commercial Lobster fishing in LFA 41 (Figure 1) occurs offshore, from the 50 nautical mile line (92 km) to the upper continental slope. While LFA 41 extends to the easterly boundary of the 4V Northwest Atlantic Fisheries Organization (NAFO) line, the fishery is limited to NAFO Divisions 4X and the Canadian portion of 5Ze.

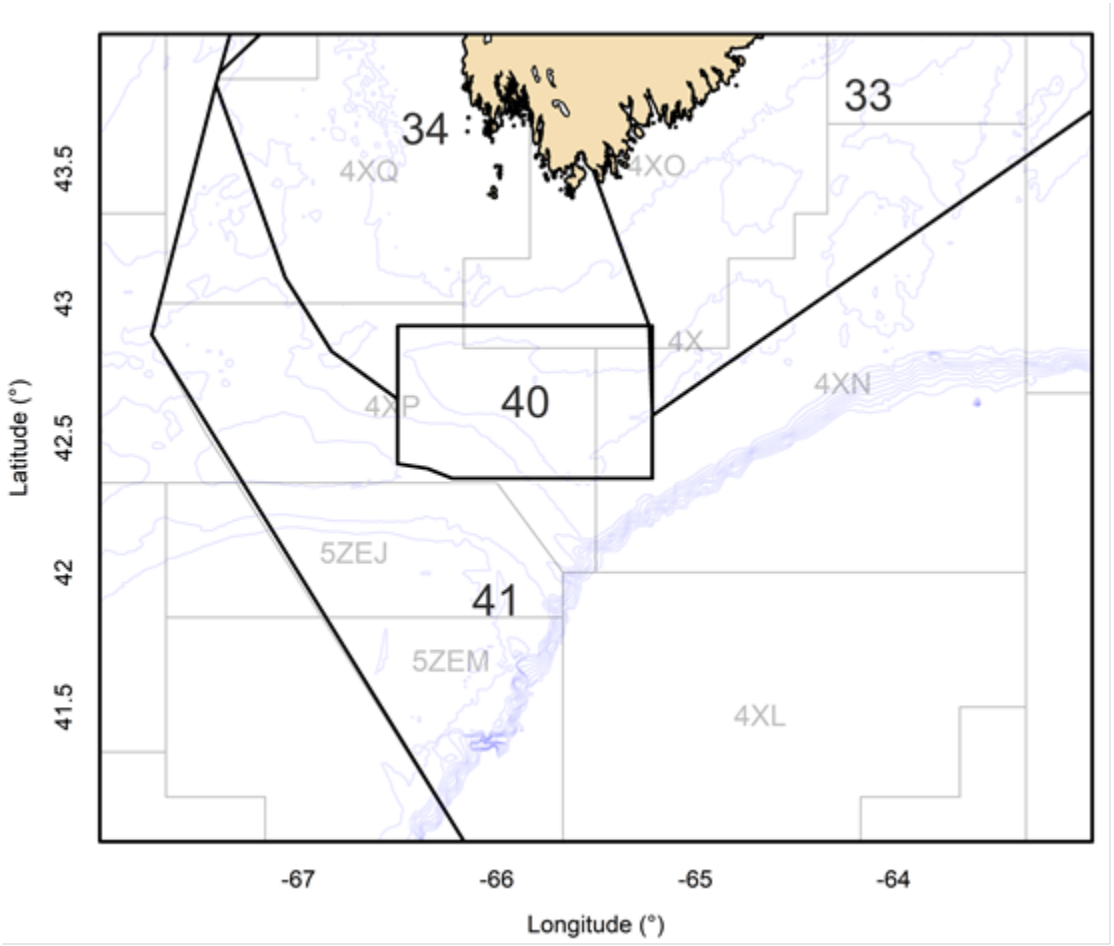

Figure 1. Map of the offshore Lobster Fishing Area 41 with corresponding NAFO Divisions.

The LFA 41 fishery operates under the Offshore Lobster and Jonah Crab Integrated Fisheries Management Plan (DFO 2020b). It is the only Lobster fishery in Canada that is managed with a Total Allowable Catch (TAC). The minimum legal size is 82.5 mm Carapace Length (CL), and there is a prohibition on landing berried and/or v-notched females. This fishery operates year-round and currently there is no trap limit. The annual TAC (720 t) was established in 1985 based on historical landings. Annual landings from 2002–2021 are presented in Figure 2. In recent years, the TAC has been managed under a three-year management cycle that allows for quota overruns and carry-forward of uncaught quota. At the end of the third year of a cycle, no more than three times the annual quotas (i.e., no more than 2,160 t) may be landed.

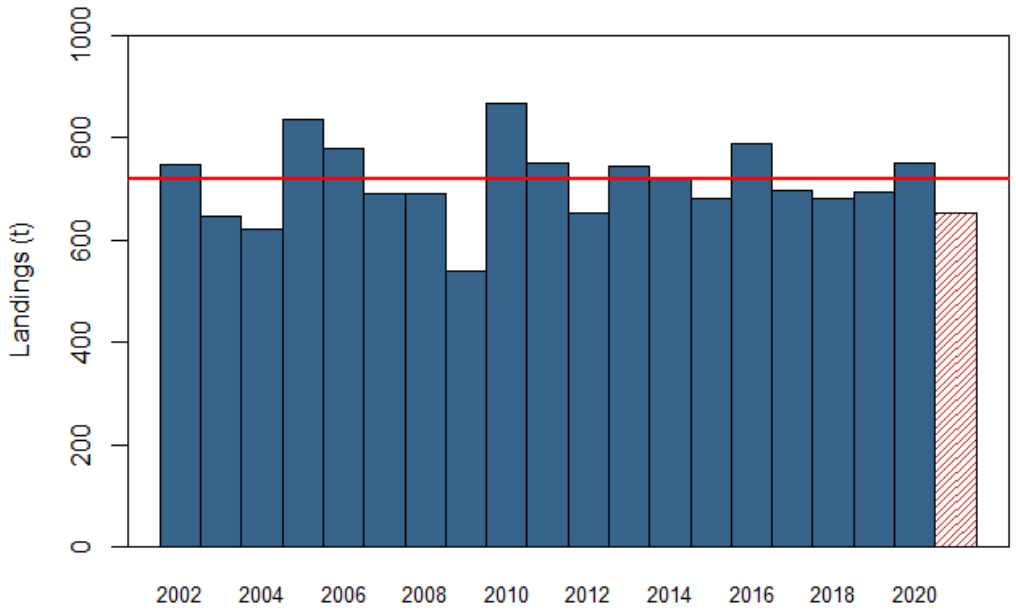

Figure 2. Landings (t) for Lobster Fishing Area 41 from 2002–2021 against a Total Allowable Catch (TAC) of 720 t. Horizontal red line denotes the TAC. Note: Red bar (hash marks) for 2021 landings indicates incomplete data.

Analysis and Response

Indicators of Stock Status

The status of Lobster in LFA 41 is assessed using two indicators of stock health: survey commercial biomass and reproductive potential. The reference points defining the Healthy, Cautious, and Critical zones—the Upper Stock Reference (USR) and the Limit Reference Point (LRP)—are based on the survey biomass. Both indicators use fishery-independent data available from four multispecies surveys, two conducted by DFO and two conducted by NEFSC. The NEFSC surveys were not conducted in 2020 due to concerns with the COVID-19 global pandemic. The spring survey took place in 2021, but the fall survey was not completed in time for the present update. Table 1 highlights the data available at the time of this update from the 2020 and 2021 field seasons. The DFO Summer Research Vessel Survey (RV41) covers the offshore portions on the Scotian Shelf, and the DFO Spring Research Vessel Survey (GB) covers the offshore portions on Georges Bank. The NEFSC surveys cover the Gulf of Maine and Georges Bank in the spring (NSpr41) and autumn (Naut41).

Table 1. Summary of available data from Northeast Fisheries Science Centre (NEFSC) and DFO Research Vessel Multispecies Surveys for the LFA 41 Stock Status Update.

Source	Survey	2020	2021
DFO	RV41	Included	Missing
DFO	GB	Included	Included

Source	Survey	2020	2021
NEFSC	NSpr41	Missing	Included
NEFSC	Naut41	Missing	Missing

Primary Indicators and Stock Status

Commercial Biomass from Research Vessel Surveys

Lobster biomass is measured by four multispecies surveys from which commercial biomass indices are used to determine overall stock health. The commercial biomass is calculated for each survey, and a 3-year running median is used to assess stock status relative to reference indicators. The Limit Reference Indicator (LRI) for each index is defined as the median of the five lowest non-zero biomasses in the time series. The Upper Stock Indicator (USI) is defined as 40% of the median of the higher productivity period (i.e., 2000–2015). Rather than relying on the inherently variable annual estimates of survey indices, the 3-year running median estimated with the available data was compared to the LRIs and USIs. For the stock to be considered in the Healthy Zone, the commercial biomass indices for at least three of the four surveys must be above their respective USIs (Figure 3). Currently, all four surveys are well above their respective USIs. Therefore, the stock is in the Healthy Zone, and it has been since 2002.

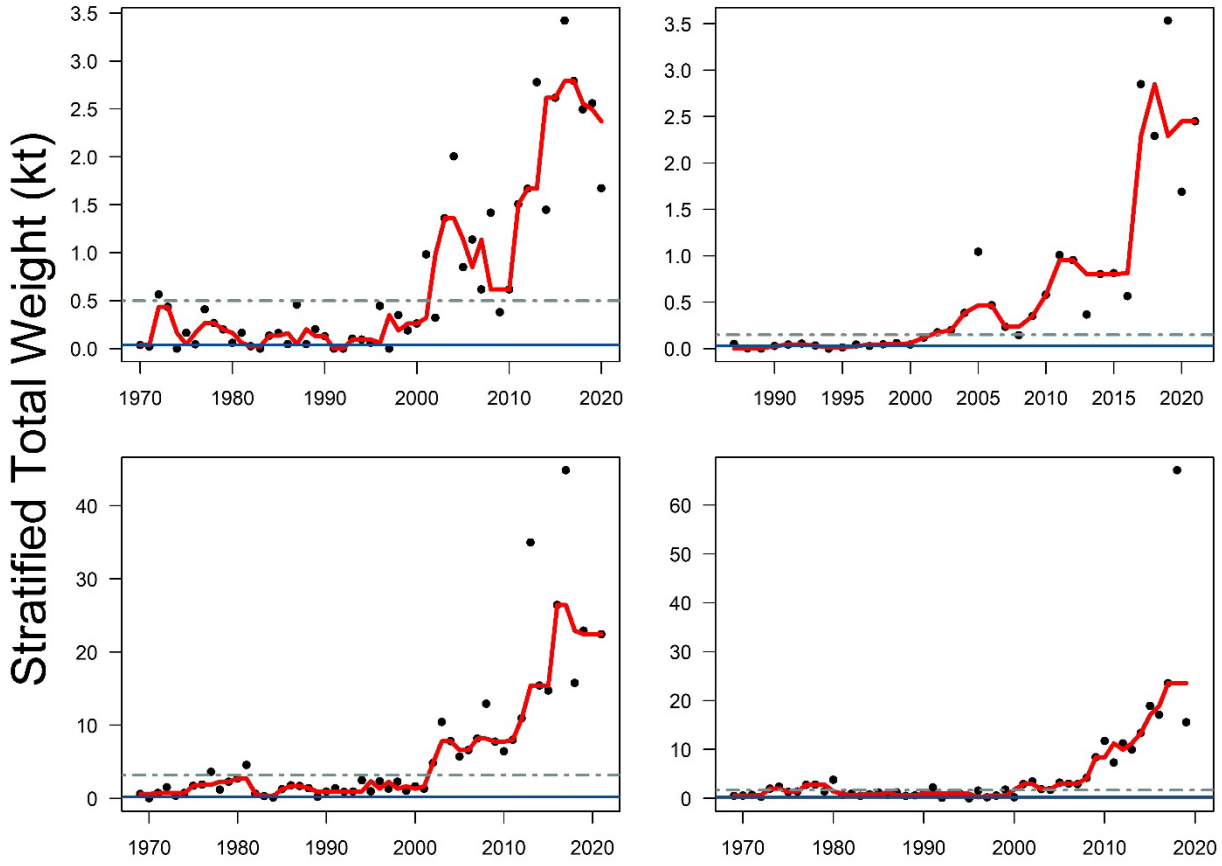

Figure 3. Commercial biomass time series along with the 3-year running median (red line), compared to Limit Reference Indicator (LRI, solid blue line) and Upper Stock Indicator (USI, dot-dash grey line). Top row: left—RV41, right—GB. Bottom row: left— NSpr41, right—Naut41. Note: Different scales are used on both x-axis and y-axis, and missing years for some panels.

Reproductive Potential

Reproductive potential consists of an integrated index combining female abundance-at-size, fecundity-at-size, and size-at-maturity (Cook et al. 2017). It represents an estimate of total eggs produced within the stock area and can also be viewed as a surrogate for Spawning Stock Biomass (SSB). An Upper Boundary (UB) and Lower Boundary (LB) have been set (where sufficient data are available) to help gauge the significance of changes in egg production relative to long-term medians. Reproductive potential is above the long-term median and the respective UBs in all survey indices. Estimates of reproductive potential are among the highest values on record (Figure 4). An increase in overall abundance was the main driver of the increase in reproductive potential despite a decrease in median size of Lobsters, as was observed in the at-sea samples and documented during the 2017 stock assessment.

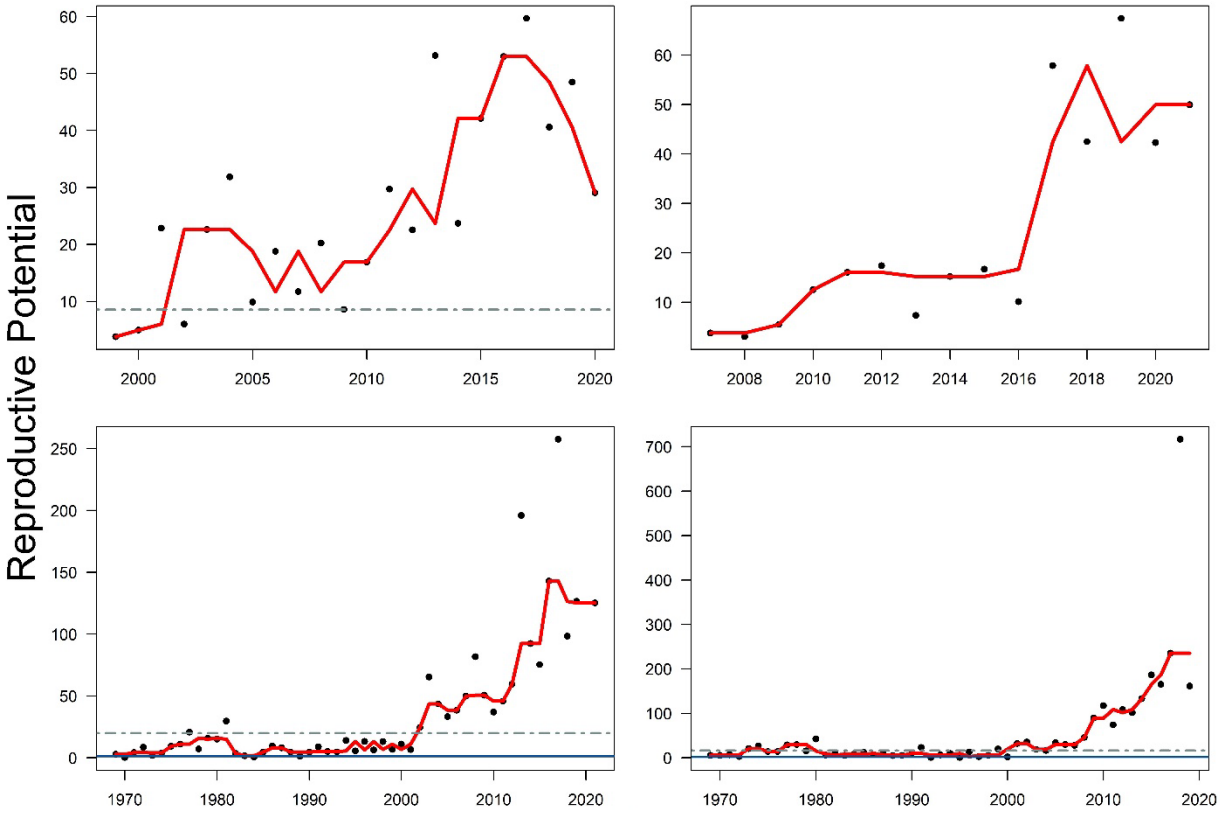

Figure 4. Reproductive potential in millions of eggs estimated from the four surveys covering LFA 41, along with the 3-year running median (solid red line). Lower bounds are represented by solid blue lines and upper bounds by dot-dash grey lines. No bounds are identified for the Georges Bank DFO survey, and only upper bounds are identified for the Summer Research Vessel Survey due to the brevity of the time series. Top row: left—RV41, right—GB. Bottom row: left—NSpr41, right—Naut41. Note: Different scales are used on both x-axis and y-axis, and there are missing years for some panels.

Bycatch

The target for number of observed trips is six per season for LFA 41. The total number of trips, observed trips, and the percentage of observer trip coverage are reported in Table 2. Bycatch data for the 2021 season were not available at the time of the update, and data were limited during the 2020 season due to the COVID-19 pandemic. Due to these data gaps, averages of annual total bycatch weights are not provided in the 2021 update (previous years can be found in DFO 2020a).

Table 2. Number of observed trips per year from 2009 to 2021 for Lobster Fishing Area 41.

Year	Total Number of Trips	Observed Trips	% of Trips Observed
2009	78	4	5.13
2010	76	3	3.95

Year	Total Number of Trips	Observed Trips	% of Trips Observed
2011	51	3	5.88
2012	32	5	15.63
2013	36	6	16.67
2014	35	6	17.14
2015	34	4	11.76
2016	36	6	16.67
2017	34	4	11.76
2018	34	7	20.59
2019	43	5	11.63
2020	45	4	8.89
2021	32	1	3.13

Conclusions

The primary indicators of stock status for Lobster in LFA 41 show the stock is in the Healthy Zone, with all four multispecies-survey-commercial-biomass indices above their respective USIs. Reproductive potential estimates were also above the upper boundaries where defined. Some recent surveys were not completed, but indices were updated where possible. Despite not having a removal reference, estimates of removal rates, or some of the fisheries independent survey data, the TAC of 720 t poses minimal risk to the stock status falling into the Cautious Zone, as the stock has proven its resilience to this level of removal. Bycatch information for the 2021 season was incomplete at the time of this update.

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Sources of Information

Cook, A.M., Cassista Da-Ros, M., and Denton, C. 2017. Framework Assessment of the Offshore American Lobster (*Homarus americanus*) in Lobster Fishing Area (LFA) 41. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/065. viii + 186 p.

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