



STOCK STATUS UPDATE OF BROWNS BANK NORTH SCALLOPS (*PLACOPECTEN MAGELLANICUS*) FOR THE 2022 FISHING SEASON

Context

Advice on the status of the Browns Bank North Scallop stock is requested annually by Fisheries and Oceans Canada (DFO) Resource Management to help determine an annual Total Allowable Catch (TAC, meat weight) in support of the fishery. The purpose of this report is to update the status of Browns Bank North Scallop with data from the 2021 Scallop survey and fishery (January 1 to December 31) to provide science advice for the management of the 2022 fishery.

This Stock Status Update uses the assessment framework accepted during the peer-reviewed Regional Advisory Process of 2011 (Hubley et al. 2011) for Browns Bank North. Updates were conducted using this framework from 2014–2020 (DFO 2020 and references therein). In 2020, the DFO Science Offshore Scallop Survey was cancelled due to challenges associated with the COVID-19 pandemic.

This update for the Scallop fishery on Browns Bank pertains to the northern part of the bank. Browns Bank South has separate management measures.

This Science Response reports results from the Regional Science Response Process of April 19, 2022, on the Stock Status Update of Offshore Scallop: Browns Bank North and Georges Bank 'a'.

Analysis and Response

The location of Browns Bank North and the other Offshore Scallop Fishing Areas (SFAs) is provided in Figure 1. The 2021 TAC was 300 tonnes (t) for Browns Bank North and total reported landings were 251 t (Figure 2). Based upon preliminary analysis of the 2021 fishery data and the annual stock survey data, an interim TAC of 200 t was set in December 2021 for the 2022 Browns Bank North fishery.

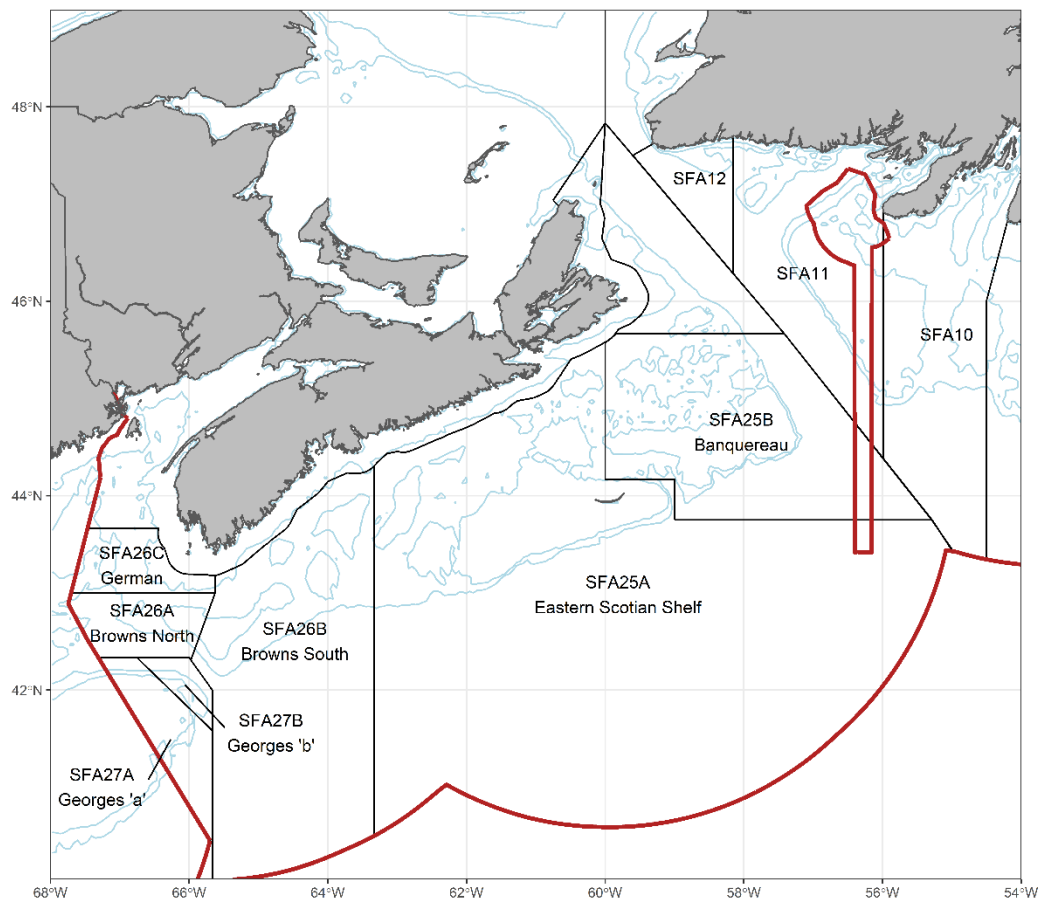


Figure 1. Map showing the Offshore Scallop Fishing Areas (SFAs) 25–27 used for management purposes in the Maritimes Region.

Science advice is provided for this stock using a Bayesian state-space modified delay difference assessment model that integrates both fishery and survey data and is described in Hubley et al. (2014). The model fit to the survey estimates of fully-recruited (≥ 95 mm shell height) biomass, recruit (85–94.9 mm shell height) biomass, and fishery Catch Per Unit Effort [CPUE, kg/(hour-metre)] are shown in Figure 3. Estimates of fully-recruited biomass in 2021 and projections of fully-recruited biomass for 2022 under various catch scenarios are presented for this stock (Table 1 and Figure 4). Reference points had been proposed for the fishery in 2012 (Smith and Hubley 2012) but were not adopted.

The 2020 survey indices used as model inputs were imputed using the median of the 2019 and 2021 values for all inputs other than growth, which used the long-term median from 1986–2019. This approach has been used to address missing information for other Scallop stocks (e.g., Nasmith et al. 2016).

The modelled median fully-recruited biomass is estimated to be 3,188 t in 2021 (Figure 4), which is below the long-term median of 5,065 t. The 2019 estimate was 3,737 t. The median recruit biomass is estimated to be 212 t in 2021, which is below the long-term median biomass of 456 t. The 2019 estimate was 218 t. The long-term median calculations (1991–2020) exclude the current year (2021) estimates.

The model’s forecasted fully-recruited biomass for 2022 is 3,273 t. This forecast accounts for fisheries removals (246 t) occurring after the survey in 2021, and assumes:

- a catch of 200 t (the interim TAC),
- the condition of Scallop in 2022 will be unchanged from 2021 (11.7 g/dm³), and
- that natural mortality in 2022 will be unchanged from 2021 (0.03).

This represents an estimated 2% increase in fully-recruited biomass from 2021 to 2022.

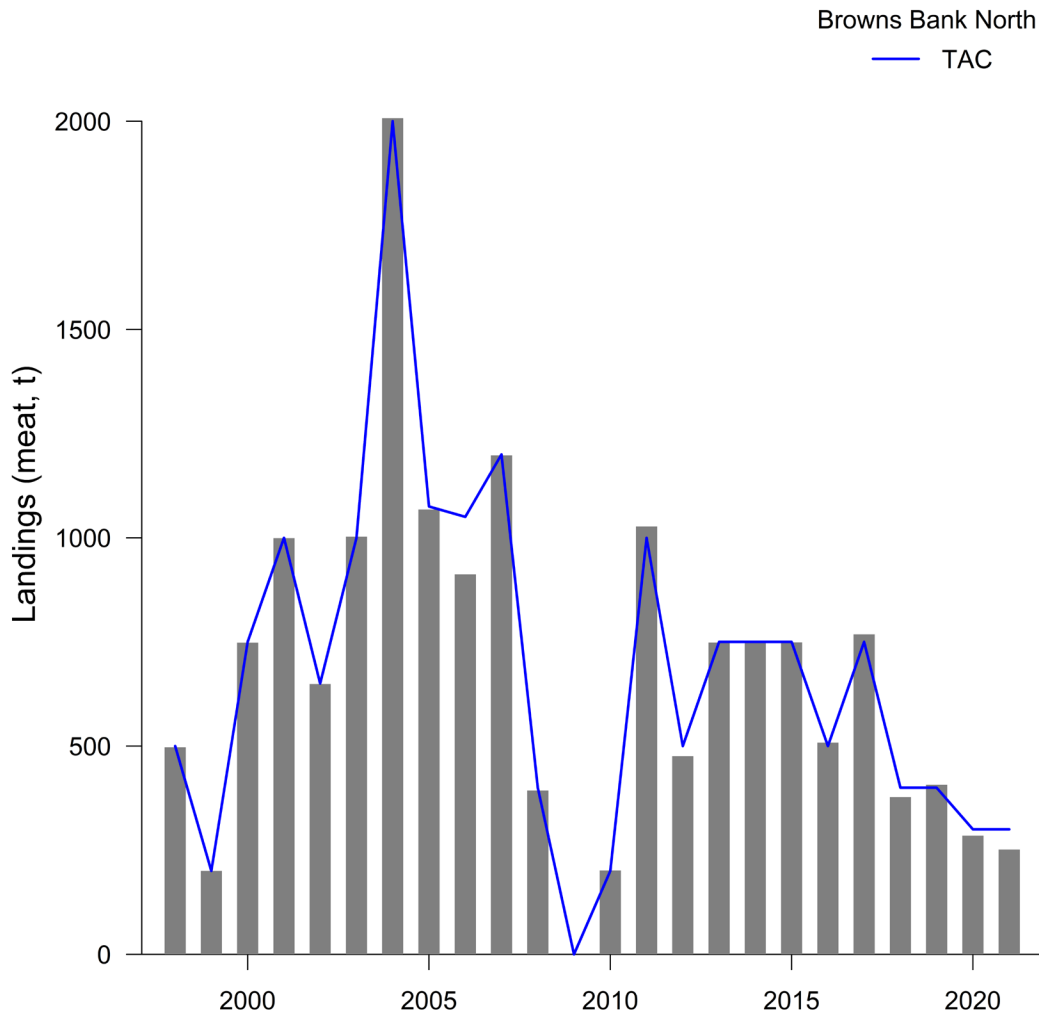


Figure 2. Landings of Scallop meats (tonnes) from Browns Bank North between 1998 and 2021. The blue line represents Total Allowable Catch (TAC), in tonnes. Prior to 1998, landings from Browns Bank North were combined with Browns Bank South.

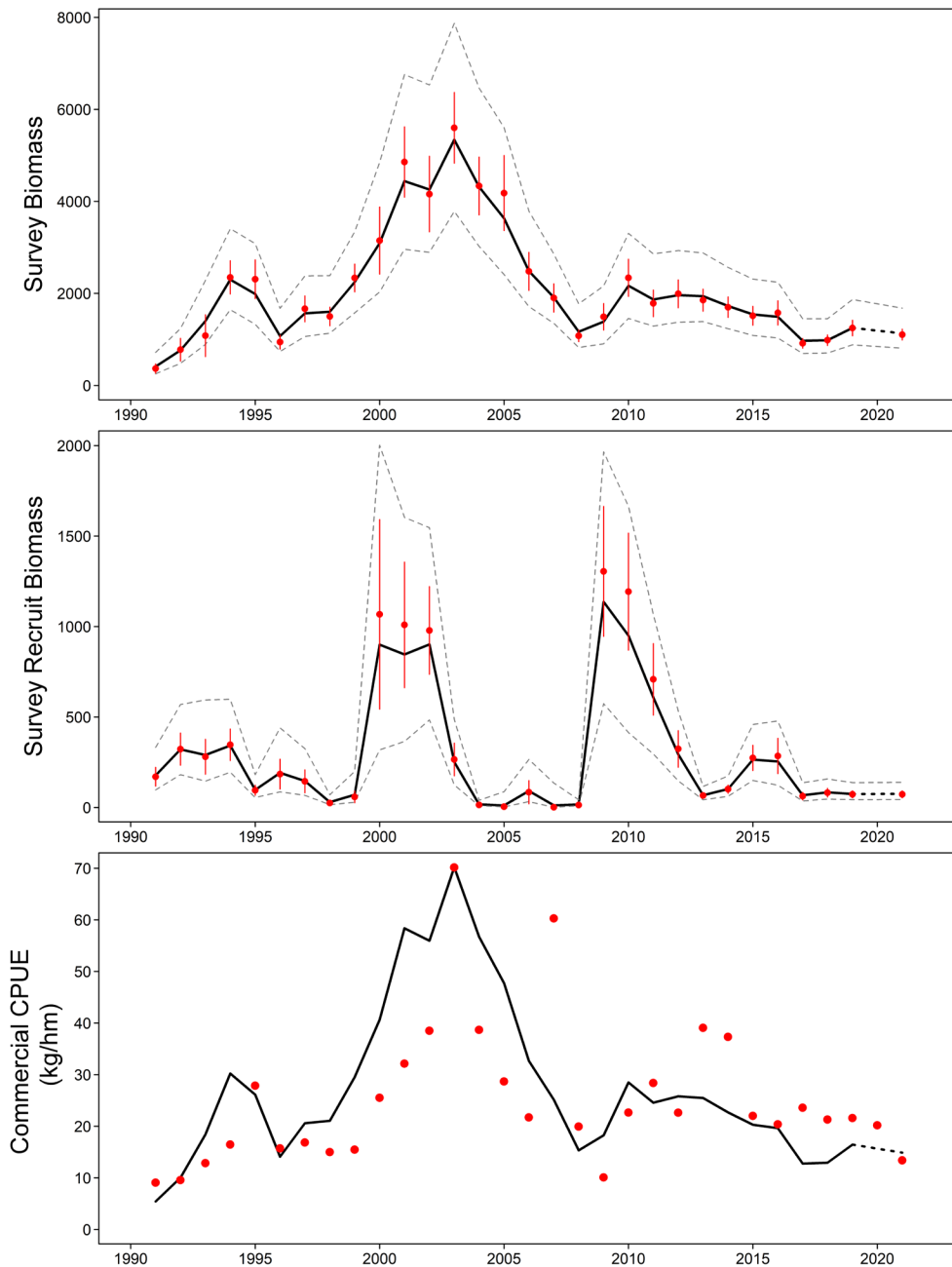


Figure 3. Summary of model results and inputs for fully-recruited survey biomass (top panel, in tonnes), recruit survey biomass (middle panel, in tonnes) and commercial CPUE (bottom panel, in kg/hour-metre) for Browns Bank North. The solid black line is the model estimate and the red circles represent observed values from the survey and the fishery. A black dashed line is used from 2019–2021 as there were no survey or model results for 2020. For the survey data, the vertical lines represent the standard error associated with the observed values and the grey dashed lines represent the modelled 95% credible intervals.

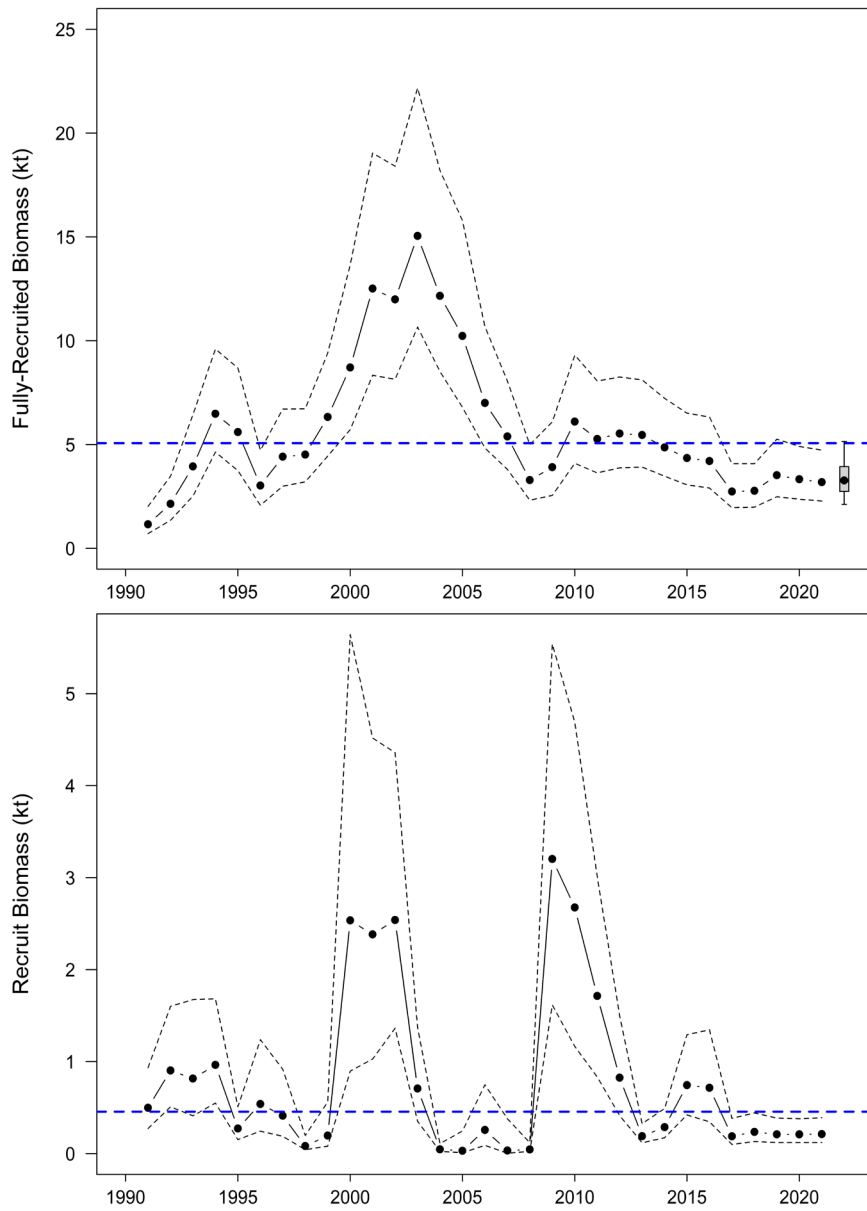


Figure 4. Biomass estimates (kilotonnes) for fully-recruited (top panel) and recruit (lower panel) Scallops from the stock assessment model fit to the Browns Bank North survey and commercial data. Dashed lines are the upper and lower 95% credible limits. The blue horizontal dashed line represents the long-term median biomass. The forecasted fully-recruited biomass for 2022 (top panel), assuming a catch of 200 t, is displayed as a box plot with median (●), 50% credible limits (box) and 80% credible limits (whiskers).

Table 1. Catch scenarios for Browns Bank North in 2022 in terms of exploitation and expected changes in fully-recruited biomass. Potential catches in 2022 are evaluated in terms of the probability of a decline in biomass. These probabilities account for uncertainty in the biomass forecasts.

Catch (t)	Exploitation Rate	Probability of Biomass Decline	Expected Change in Biomass (%)
150	0.11	0.44	4
200	0.12	0.47	2
250	0.13	0.49	1
300	0.15	0.51	-1
350	0.16	0.54	-3
400	0.17	0.57	-4
450	0.19	0.59	-6
500	0.20	0.62	-8
550	0.22	0.65	-10
600	0.23	0.67	-11

Conclusions

Catch scenarios ranging from 150 t to 600 t were examined and are presented in Table 1, assuming condition and total natural mortality remain unchanged from 2021. All catch scenarios below 300 t are projected to result in increases in fully-recruited biomass, with a probability of biomass decline ranging from 0.44 (150 t) to 0.49 (250 t). The change in biomass varied from 4% to -11% for the catch scenarios presented (Table 1). Catch of 200 t (the 2022 interim TAC) results in an exploitation rate of 0.12 and an expected 2% increase in biomass (Table 1).

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Sources of Information

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