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Science Response 2019/036

Maritimes Region

STOCK STATUS UPDATE OF GEORGES BANK 'A' SCALLOPS (*PLACOPECTEN MAGELLANICUS*) FOR THE 2019 FISHING SEASON

Context

Advice on the status of the Georges Bank Scallop stock is requested annually by Fisheries and Oceans Canada (DFO) Resource Management to help determine a Total Allowable Catch (TAC, meat weight) in support of the fishery. The purpose of this report is to update the status of Georges Bank 'a' Scallop with data from the 2018 Scallop survey and fishery to provide science advice for the management of the 2019 fishery. The last peer-reviewed Regional Advisory Process for this stock occurred in 2013 (DFO 2013, Hubley et al. 2014) and updates have been conducted since 2014 (DFO 2014, 2015, 2016, 2017, 2018).

This update for the Scallop fishery on Georges Bank pertains to zone 'a'. The assessment and advice presented in this document use the assessment framework established in 2009 (Jonsen et al. 2009). Georges Bank zone 'b' is a marginal growth area for Scallops and has separate management measures. Some elements of the fishery in zone 'b' are also presented for continuity.

This Science Response reports results from the Science Response Process of April 9, 2019, on the Stock Status Update of Offshore Scallop: Browns Bank North and Georges Bank 'a'.

Analysis and Response

The location of Georges Bank 'a' and the other Offshore Scallop Fishing Areas (SFAs) is provided in Figure 1. The final TAC in 2018 was 3,400 tonnes (t) for zone 'a', and 750 t for zone 'b'. With quota carry forward, the adjusted 2018 TAC for zone 'a' was 3,411 t. Total reported landings in 2018 were 3,397 t for zone 'a' and 764 t for zone 'b' (Figure 2). Based upon preliminary analysis of the 2018 fishery data and the annual stock survey data, an interim TAC of 4,000 t was set in December 2018 for the 2019 Georges Bank zone 'a' fishery and 800 t for zone 'b'.

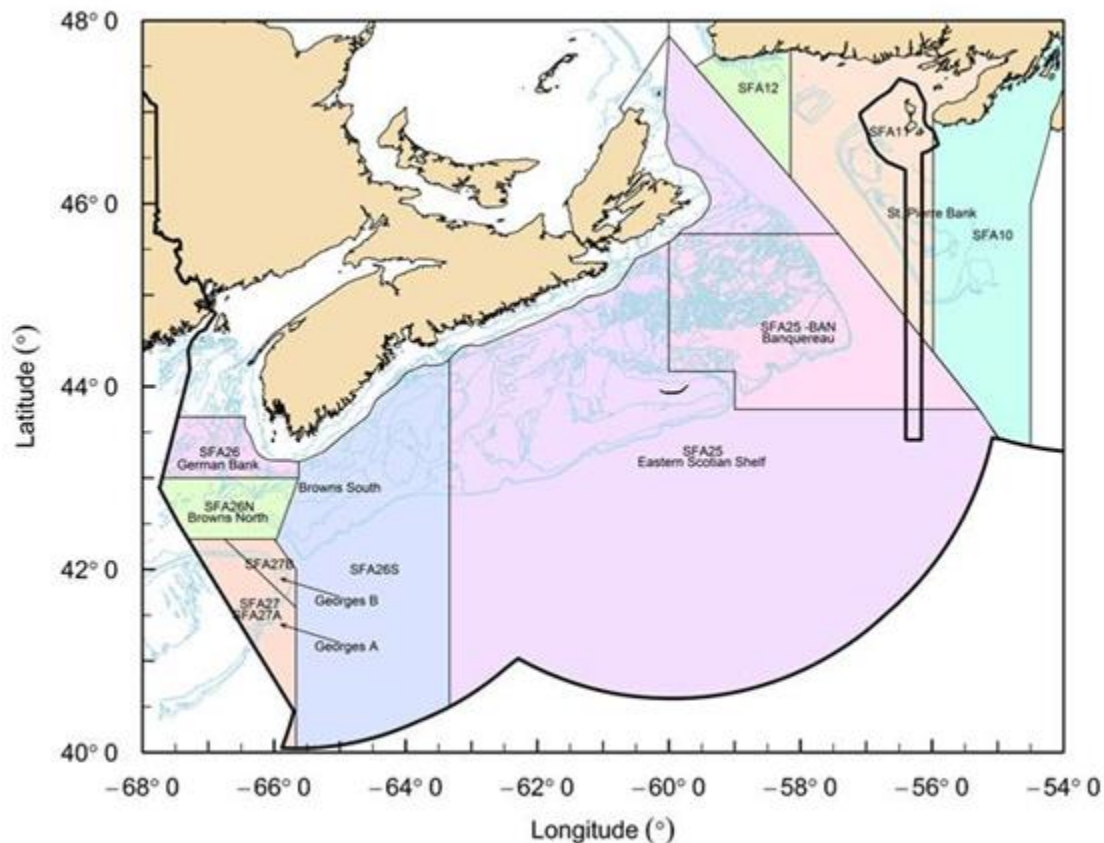


Figure 1. Map showing the offshore Scallop Fishing Areas (SFAs) 25-27 used for management purposes in the Maritimes Region. Note the division of Georges Bank 'a' and 'b' as subareas of SFA 27.

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) biomass, and fishery Catch Per Unit Effort (CPUE, kg/(hour-metre)) are shown in Figure 3. Estimates of fully-recruited biomass in 2018 and projections of fully-recruited biomass for 2019 under various catch scenarios are presented and compared to established reference points for this stock (Table 1 and Figure 4).

The modelled median fully-recruited biomass is estimated to be 28,831 t in 2018 (Figure 4), which is above the long-term median of 16,690 t. The long-term median calculations (1986-2017) exclude the current year (2018) estimates. The 2017 estimate was 21,272 t. The median recruit biomass is estimated to be 5,088 t in 2018, which is above the long-term median biomass of 3,536 t. The 2017 estimate was 3,762 t.

Indicator of stock status

Georges Bank 'a' reference points are based on 30% and 80% of the mean modelled biomass from 1986 to 2009 (Smith and Hubley 2012, Hubley et al. 2014; DFO 2015). The probability that the 2018 biomass is currently above the Upper Stock Reference (USR) and in the Healthy Zone is approximately 0.99. The model forecasted median fully-recruited biomass for 2019 is 36,220 t. This forecast assumes:

- a catch of 4000 t (the interim TAC),
- the condition of Scallop in 2019 will be unchanged from 2018 (16.4 g/dm^3), and
- that total natural mortality in 2019 will be unchanged from 2018 (0.04).

This represents an estimated 25% increase in fully-recruited biomass from 2018 to 2019.

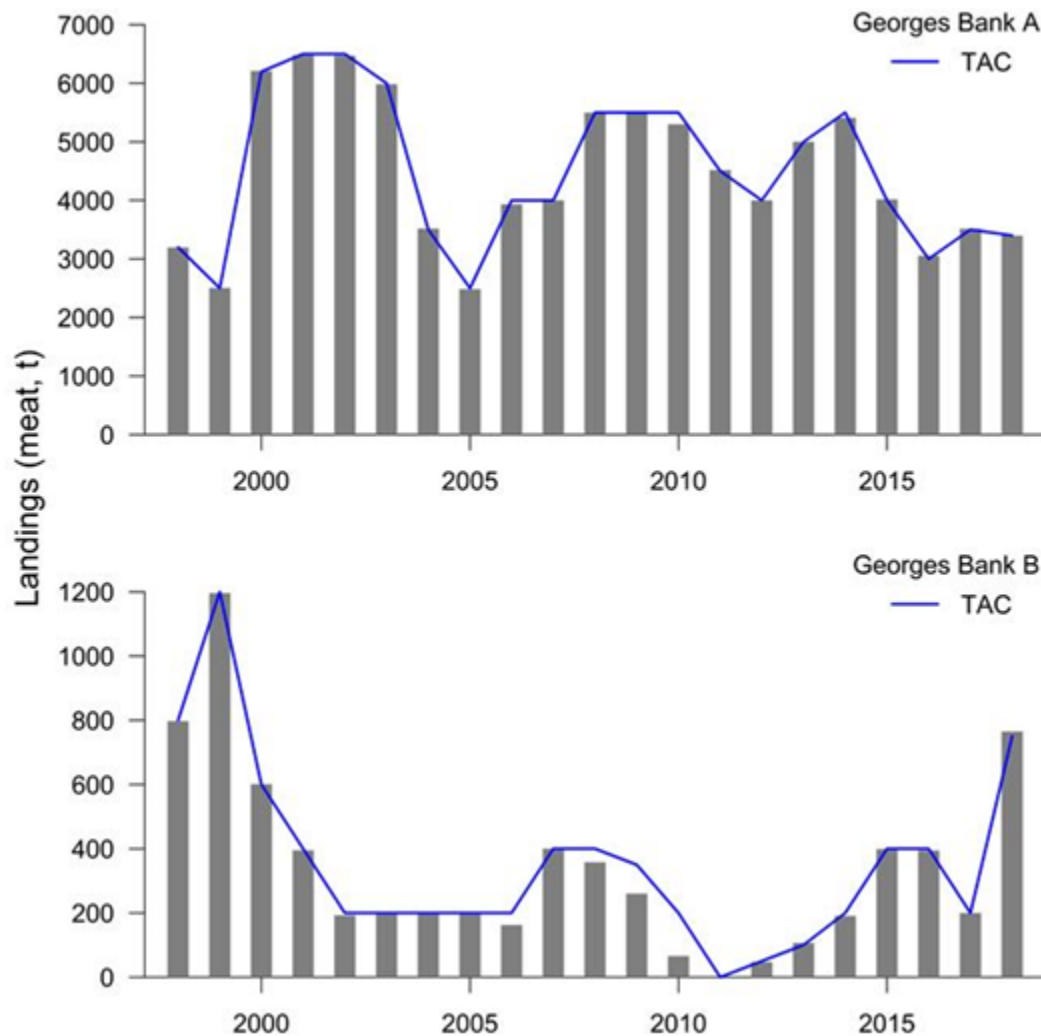


Figure 2. Landings of Scallop meats (tonnes) from Georges Bank 'a' (top panel), and 'b' (lower panel) between 1998 and 2018. The blue line represents Total Allowable Catch (TAC), in tonnes. Prior to 1998, landings from Georges Bank 'a' and 'b' were combined.

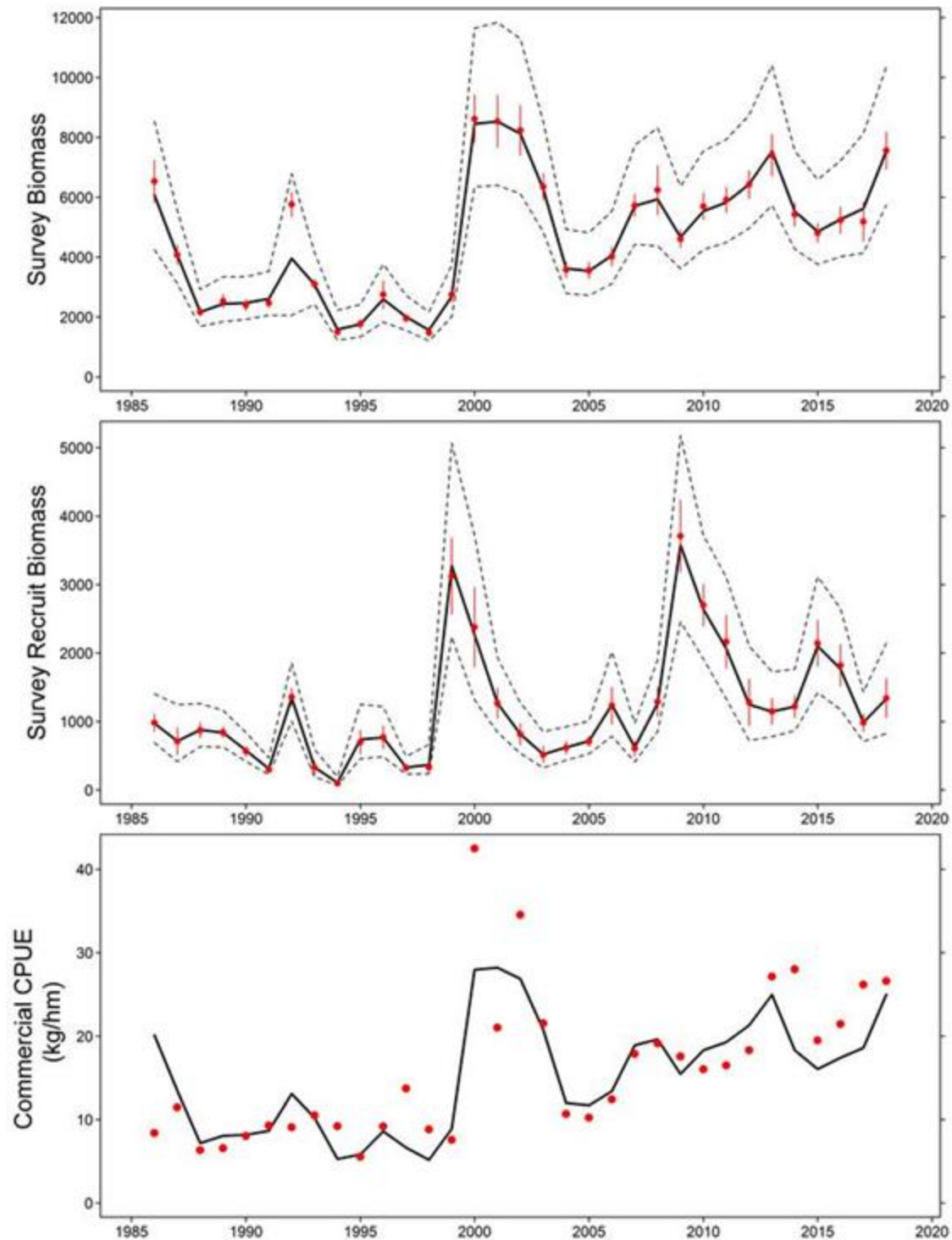


Figure 3. Summary of model results and inputs for fully-recruited survey biomass (top panel, in tonnes), recruit survey biomass (middle panel, in tonnes), and commercial CPUE (bottom panel, in kg/hour-metre) for Georges Bank 'a'. The solid black line is the model estimate. The red circles represent observed values from the survey and the fishery. For the survey data, the vertical lines represent the standard error associated with the observed values, and the dashed lines represent the modelled 95% credible intervals.

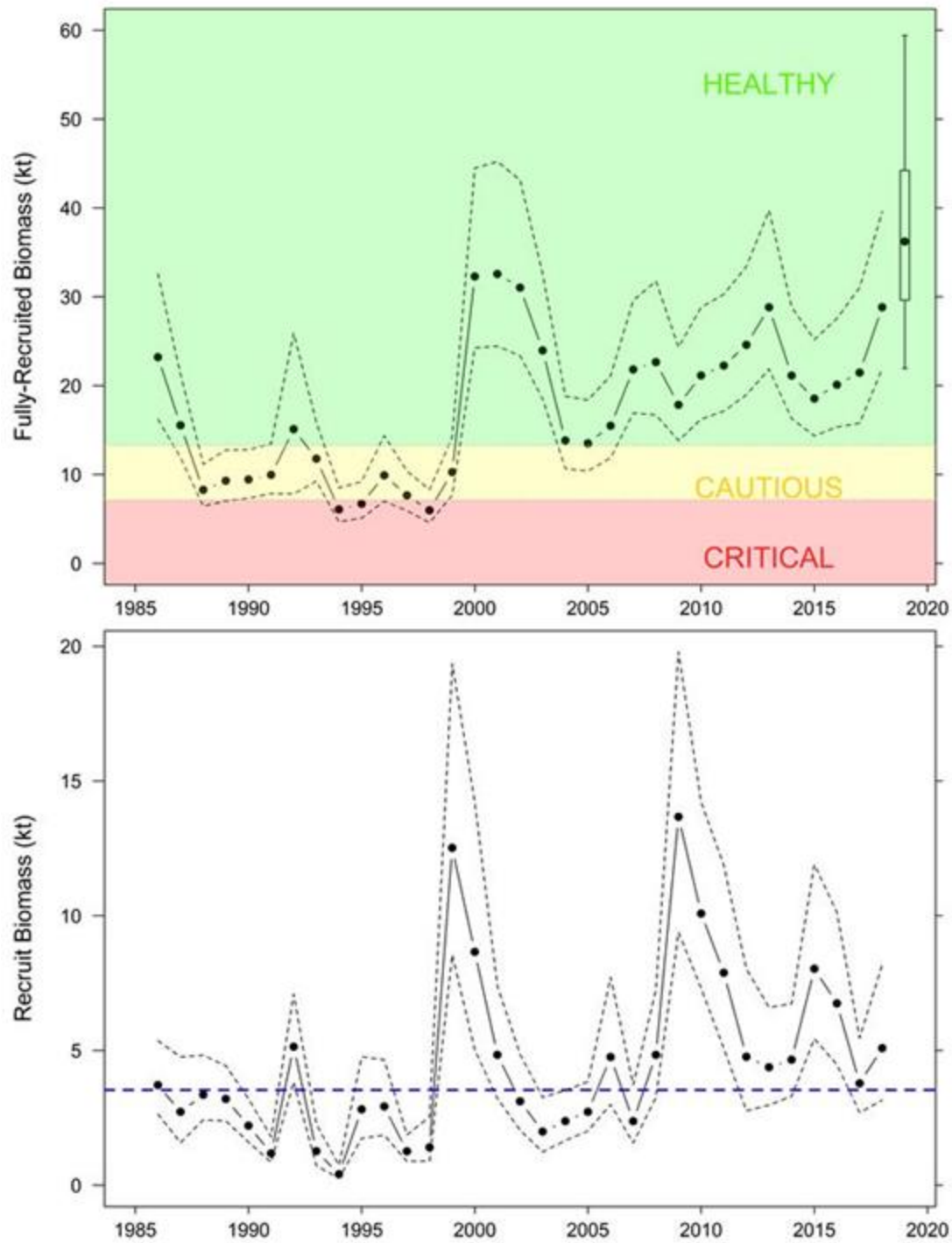


Figure 4. Biomass estimates (kilotonnes) for fully-recruited (top panel) and recruit (lower panel) Scallops from the stock assessment model fit to the Georges Bank 'a' survey and commercial data. The black dashed lines are the upper and lower 95% credible limits. Coloured zones (from top to bottom) represent the Healthy (green), Cautious (yellow), and Critical (red) zones (reference points described in text). The blue horizontal dashed line in the lower panel represents the long-term median recruit biomass. The forecasted fully-recruited biomass for 2019, assuming a catch of 4,000 t, is displayed as a box plot with median (●), 50% credible limits (box), and 80% credible limits (whiskers).

Table 1. Catch scenarios for Georges Bank 'a' in 2019 in terms of exploitation and expected changes in fully-recruited biomass. Potential catches in 2019 are evaluated in terms of the probability of a decline in biomass and exceeding the Upper Stock Reference (USR) and Lower Reference Point (LRP). These probabilities account for uncertainty in the biomass forecasts.

Catch (t)	Exploitation Rate	Probability of Biomass Decline	Expected Change in Biomass (%)	Probability biomass will exceed USR	Probability biomass will exceed LRP
1000	0.03	0.18	37	>0.99	>0.99
1500	0.04	0.19	35	>0.99	>0.99
2000	0.06	0.21	33	0.99	>0.99
2500	0.07	0.22	31	0.99	>0.99
3000	0.08	0.23	28	0.99	>0.99
3500	0.09	0.25	27	0.99	>0.99
4000	0.11	0.26	25	0.99	>0.99
4500	0.12	0.28	22	0.99	>0.99
5000	0.13	0.29	20	0.99	>0.99
5500	0.14	0.31	18	0.99	>0.99
6000	0.16	0.33	16	0.99	>0.99
6500	0.17	0.35	14	0.99	>0.99

Conclusions

The 2019 interim TAC of 4,000 t results in an exploitation rate of 0.11. Catch scenarios ranging from 1,000 t to 6,500 t are presented in Table 1, assuming condition and total natural mortality remain unchanged from 2018. All catch scenarios presented are projected to result in increases in fully-recruited biomass, with a probability of biomass decline ranging from 0.18 to 0.35. The probability that biomass will remain in the Healthy Zone is 0.99 or greater for all catch scenarios presented (Table 1).

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