



STOCK STATUS UPDATE FOR SCALLOP (*PLACOPECTEN MAGELLANICUS*) IN SCALLOP FISHING AREA 29 WEST OF LONGITUDE 65°30'

Context

Advice on the status of Scallops in Scallop Fishing Area (SFA) 29 West of Longitude 65°30' (herein referred to as SFA 29 West) is requested annually by Fisheries and Oceans Canada (DFO) Resource Management to help determine a Total Allowable Catch (TAC) and estimate risk of different harvest scenarios in support of the fishery. Scallop in SFA 29 West are assessed on a multiyear schedule, with update reports produced in interim years. The last full assessment of SFA 29 West was conducted in 2015 (DFO 2015; Sameoto et al. 2015) and is updated annually (DFO 2016, 2017, 2018).

The objectives of this Science Response are to update the status of the SFA 29 West Scallop stocks in 2018, evaluate the bycatch of non-target species from information that may be available during the 2018 fishery, and evaluate the consequence of various harvest levels for the 2019 fishery.

This Science Response Report results from the Science Response Process of March 14, 2019, on the Stock Status Update of Scallop in Scallop Fishing Area (SFA) 29 West of 65°30'.

Background

Population surveys have been conducted annually in SFA 29 West by DFO Science since 2001. The survey occurs in September/October after the fishery has closed. The current survey design uses the Scallop habitat suitability map developed by Brown et al. (2012) and bins habitat suitability probabilities into three categories defined by the following ranges: Low [0, 0.3), Medium [0.3, 0.6), and High [0.6, 1.0). Habitat suitability represents a relative probability scale of suitable Scallop habitat, with the lowest suitable Scallop habitat indicated by 0 and the highest suitable habitat indicated by 1. The population dynamics of commercial and recruit Scallops are modelled using the state-space habitat-based assessment model as defined by Smith et al. (2015). Throughout this update, Scallops with a shell height of 100 mm and greater are referred to as commercial size. Scallops with a shell height of 90–99 mm are referred to as recruits and are expected to grow to commercial size in the following year. Scallops with a shell height of less than 90 mm are considered pre-recruits.

In this update, Scallop removals include all commercial landings from SFA 29 West and Food, Social, and Ceremonial (FSC) catch by scallop drag. Landed recreational and FSC catch by dip netting, diving, tongs, and hand are not available and not accounted for in the assessment.

Description of the Fishery

Scallop Fishing Area 29 encompasses a large area inside the 12-mile territorial sea, from the south of Yarmouth (latitude 43°40'N) to Cape North in Cape Breton. This update refers to only that portion of SFA 29 West of longitude 65°30'W continuing north to Scallop Production Area 3

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at latitude 43°40'N (Figure 1). The fishing season generally runs from the third week of June to the end of August with the duration of the fishery variable each year. This area is fished by the Full Bay (FB) Fleet and inshore East of Baccaro licence holders who are authorized to fish in SFA 29 West (hereafter referred to as the EoB Fleet). The SFA 29 West fishery has occurred since 2001. The fishery is managed using limited entry, seasonal closures, minimum shell height, and meat count. Both fleets operate under an Individual Transferable Quota (ITQ) system in this area. The TACs are set, and landings are reported in terms of meat weights (adductor muscles).

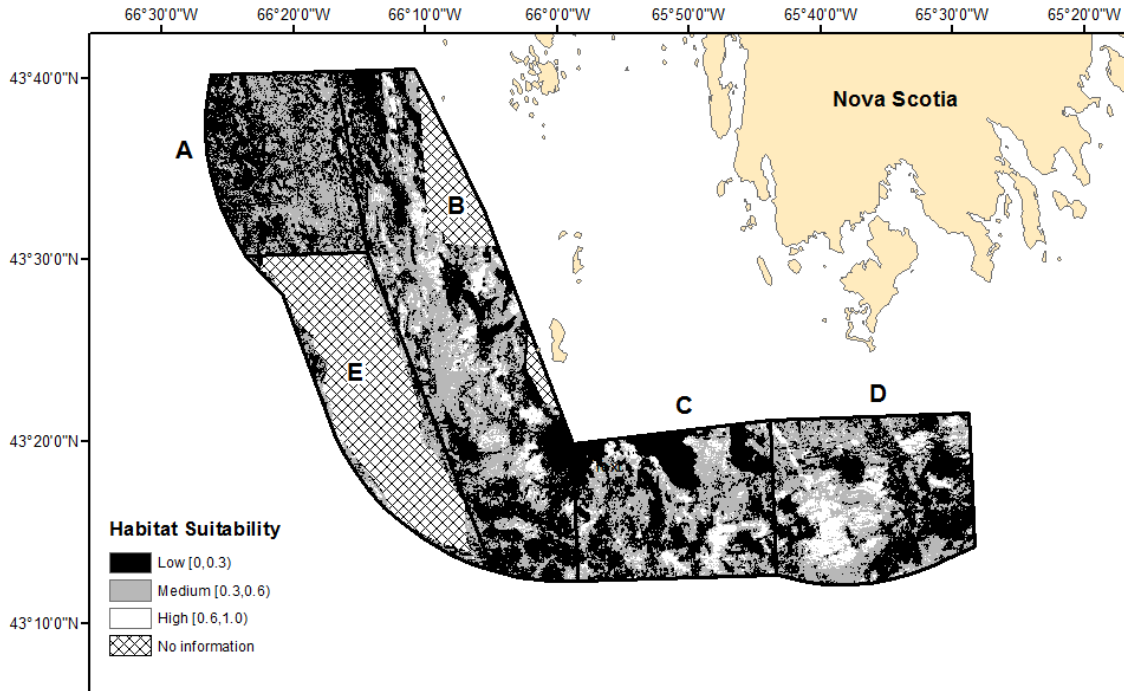


Figure 1. The SFA 29 West Subareas A to E. Shaded areas show habitat suitability probability categories: Low [0, 0.3) in black, Medium [0.3, 0.6) in grey, and High [0.6, 1.0) in white (see Brown et al. 2012). Note: SFA 29 extends along the shoreline to Cape North in Cape Breton.

Analysis and Response

Commercial Fishery

Since 2002, the TAC (meat weight) has been shared between the FB and EoB fleets. As of 2010, the TAC and landings are reported for both fleets combined. In 2018, a total of 124.3 tonnes of meats (t) were landed against the TAC of 130 t. There was an additional FSC catch of 13.1 t, which does not count towards the TAC (Figure 2).

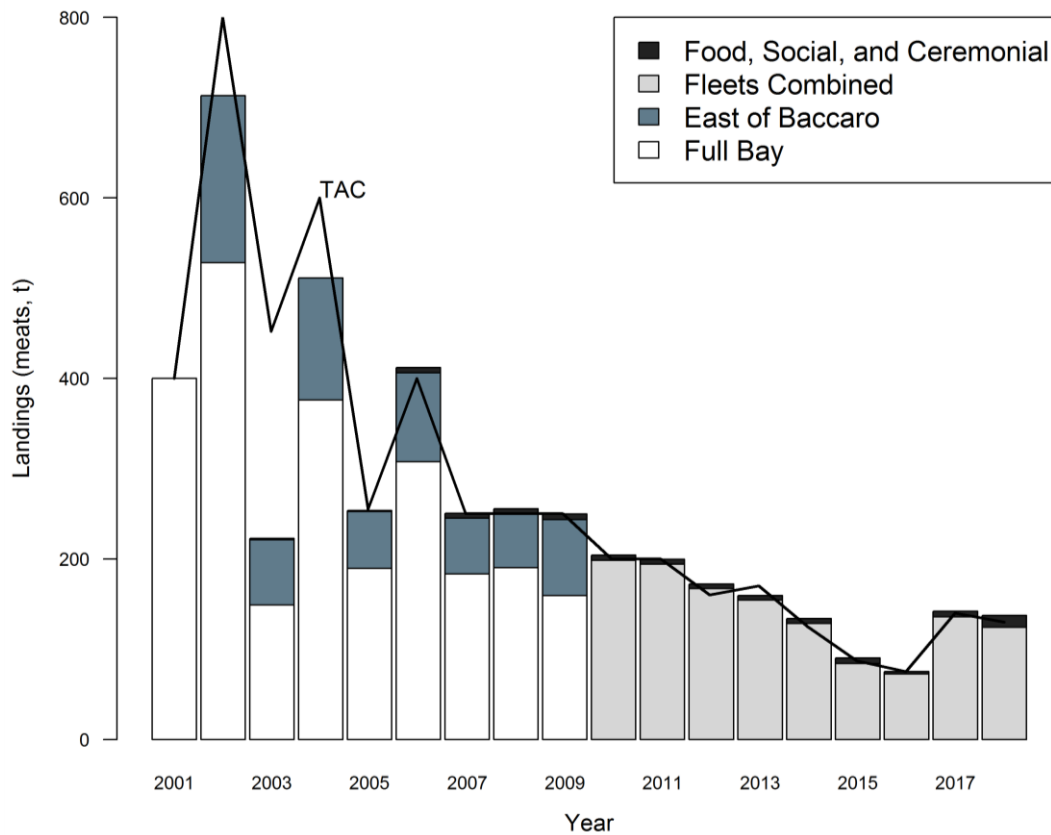


Figure 2. Annual Scallop landings (meats, t) from 2001 to 2018 for SFA 29 West and the TAC (black line). Note that the Food, Social, and Ceremonial landings do not count against the TAC.

In 2018, the Scallop fishery in SFA 29 West, in Subareas A, C, D, and E, was open and had landings (Appendix). Subarea B was closed in 2018; however, minimal removals occurred in this subarea (Appendix). For Subarea A, commercial biomass was projected to decline in each year since 2015, even with zero catch in this Subarea (DFO 2015; 2016; 2017; 2018). The fishery in Subarea A was subsequently closed in 2015 and 2016. In 2017, the fishery in Subarea A reopened, using a fishing plan that included a dedicated quota of 15 t and fishing trips to Subarea A could not hail and move to any other subarea (i.e. vessels could not fish Subarea A and another subarea during the same trip). This fishing plan was also used in 2018, with a dedicated quota of 10 t. To collect additional information on Subarea A, a voluntary Science log was provided for reporting catch and effort information at a higher resolution than the mandatory logbooks (6 hour watches versus daily reporting). In 2018, 2 voluntary Science logs were submitted; however, it was not possible to complete an analysis based on the information provided.

In 2018, the Subarea A catch rate calculated from fishing logs for the FB Fleet increased from 14.2 kg/h in 2017 to 16.7 kg/h in 2018. The catch rate for the EoB Fleet was 10.2 kg/h in 2017 and due to *Privacy Act* considerations, the catch rate for the EoB Fleet cannot be reported in 2018. Subarea B catch rates in 2018 are not available as the fishery was closed. In Subarea C, catch rates remained similar from 2017 to 2018 for the FB Fleet (34.5 kg/h in 2017 to 34.3 kg/h in 2018) and EoB Fleet (32.2 kg/h in 2017 to 31.8 kg/h in 2018). In Subarea D, there were decreases in catch rates for both fleets: from 72.2 kg/h in 2017 to 66.1 kg/h in 2018 for FB and from 72.7 kg/h in 2017 to 60.6 kg/h in 2018 for EoB. The 2018 catch rate in Subarea E was

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15.1 kg/h for the FB Fleet, and due to *Privacy Act* considerations, catch rate data for the EoB Fleet cannot be reported.

Research Survey

In 2018, commercial sized Scallops were observed throughout the majority of the survey area in SFA 29 West, with the highest density patches located in Subareas B and D (Figure 3). In Subarea A, the number of commercial sized Scallops increased in the Medium and Low habitat categories (there is no High category habitat in Subarea A). In Subarea B, commercial sized Scallop abundances increased in the High, Medium, and Low habitat categories. In Subarea C, commercial sized Scallop abundances decreased in all habitat categories. In Subarea D, commercial sized Scallop abundances decreased in the High habitat, and increased in the Medium and Low habitat categories.

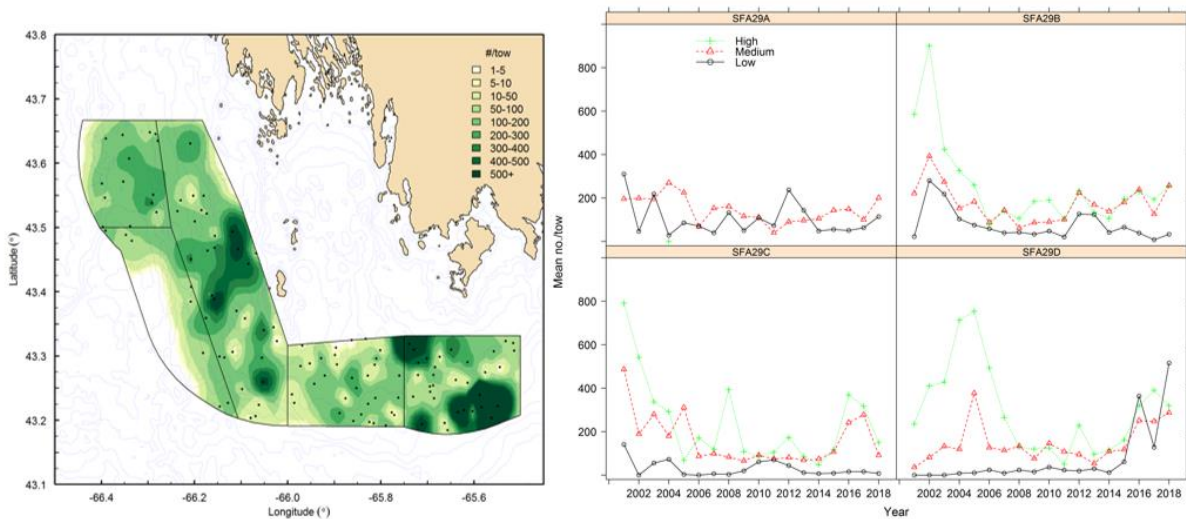


Figure 3. Commercial Scallops (≥ 100 mm shell height). On left: spatial density (numbers/tow) distribution from the 2018 survey for SFA 29 West. Points represent tow locations. On right: mean number per tow by subarea from 2001 to 2018 for Low [0, 0.3] (black circles), Medium [0.3, 0.6] (red triangles), and High [0.6, 1.0] (green crosses) categories of habitat suitability probabilities.

In 2018, the abundance of recruit sized Scallops was patchy, with the highest densities in Subarea D (Figure 4). In Subarea A, recruit abundances remained similar in both the Medium and Low habitat category. In Subarea B, recruit abundance decreased in the High and Medium, and remained similar in the Low habitat category. In Subarea C, recruit abundance decreased in all habitat categories. In Subarea D, recruit abundance decreased in the High and increased in the Medium and Low habitat.

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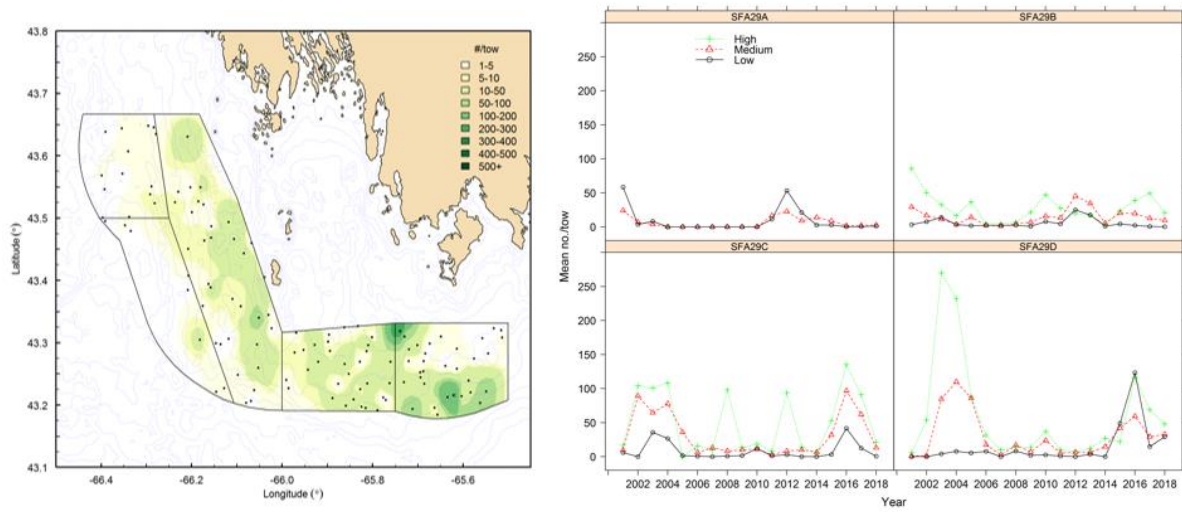


Figure 4. Recruit Scallops (90-99 mm shell height). On left: spatial density (numbers/tow) distribution from the 2018 survey for SFA 29 West. Points represent tow locations. On right: mean number per tow by subarea from 2001 to 2018 for Low [0, 0.3] (black circles), Medium [0.3, 0.6] (red triangles), and High [0.6, 1.0] (green crosses) categories of habitat suitability probabilities.

In 2018, the abundance of pre-recruit sized Scallops was patchy, with the highest densities in Subarea A (Figure 5). In Subarea A, pre-recruit abundances in 2018 increased from 2017 in the Low habitat and decreased in the Medium habitat. Pre-recruit abundances decreased in all habitat categories in Subareas B, C, and D.

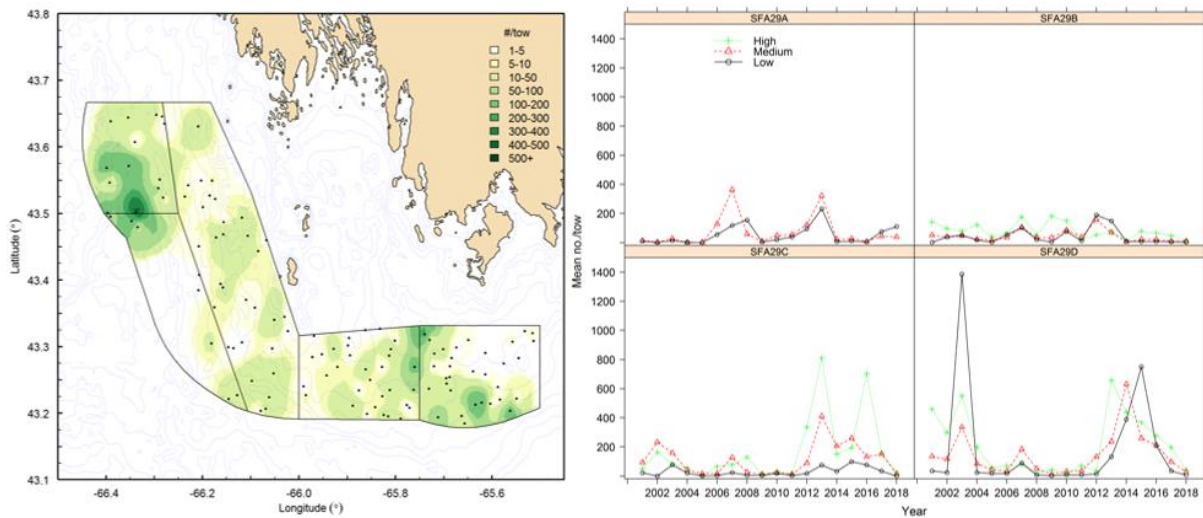


Figure 5. Pre-recruit Scallops (< 90 mm shell height). On left: spatial density (numbers/tow) distribution from the 2018 survey for SFA 29 West. Points represent tow locations. On right: mean number per tow by subarea from 2001 to 2018 for Low [0, 0.3] (black circles), Medium [0.3, 0.6] (red triangles), and High [0.6, 1.0] (green crosses) categories of habitat suitability probabilities.

Subarea E was not surveyed between 2005-2012, as it was considered a marginal area and less of a survey priority. Since 2012, a small number of stations (5-8 per year) have been surveyed each year. Since 2014, the tows have been allocated within a portion of Subarea E

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known to have been historically fished. Therefore, trends in survey abundance in Subarea E may not be indicative of trends in the subarea as a whole. Scallop numbers decreased for commercial (91.2/tow in 2017 to 81.1/tow in 2018), recruit (6.9/tow in 2017 to 2.4/tow in 2018), and pre-recruit size scallops (41.2/tow in 2017 to 38.4/tow in 2018).

Throughout SFA 29 West, Scallop condition during the survey (measured in grams per cubic decimeter (g/dm^3)) ranged from $12.7 \text{ g}/\text{dm}^3$ (Subarea A) to $13.1 \text{ g}/\text{dm}^3$ (Subarea C). There was an increase in condition in all subareas from 2017 to 2018.

Assessment Model

The state-space habitat-based population model accepted at the framework assessment in February 2014 (Smith et al. 2015) was fit within each habitat suitability category for Subareas A to D. The model was fit to the commercial catch, effort derived from vessel monitoring systems, and survey data. Subarea E is not covered by the habitat suitability map and is not modelled.

Model Exploitation

Model estimated exploitation was 0.2 or less in all subareas in 2018 (Figure 6). Subarea A exploitation decreased from 0.08 in 2017 to 0.03 in 2018 in Medium, and from 0.03 in 2017 to 0.01 in 2018 in Low habitat categories. Subarea B was closed to fishing and therefore exploitation was 0 for this area. Exploitation increased from 2017 to 2018 in all habitat categories in Subarea C. Exploitation in High habitat increased from 0.08 in 2017 to 0.18 in 2018, in Medium from 0.02 in 2017 to 0.1 in 2018, and in Low from 0.01 in 2017 to 0.02 in 2018. In Subarea D, exploitation decreased from 2017 in High and Low and remained similar in Medium habitat. Exploitation decreased from 0.17 to 0.13 in 2018 in the High habitat, from 0.04 to 0.01 in the Low habitat, and remained at 0.08 in the Medium habitat.

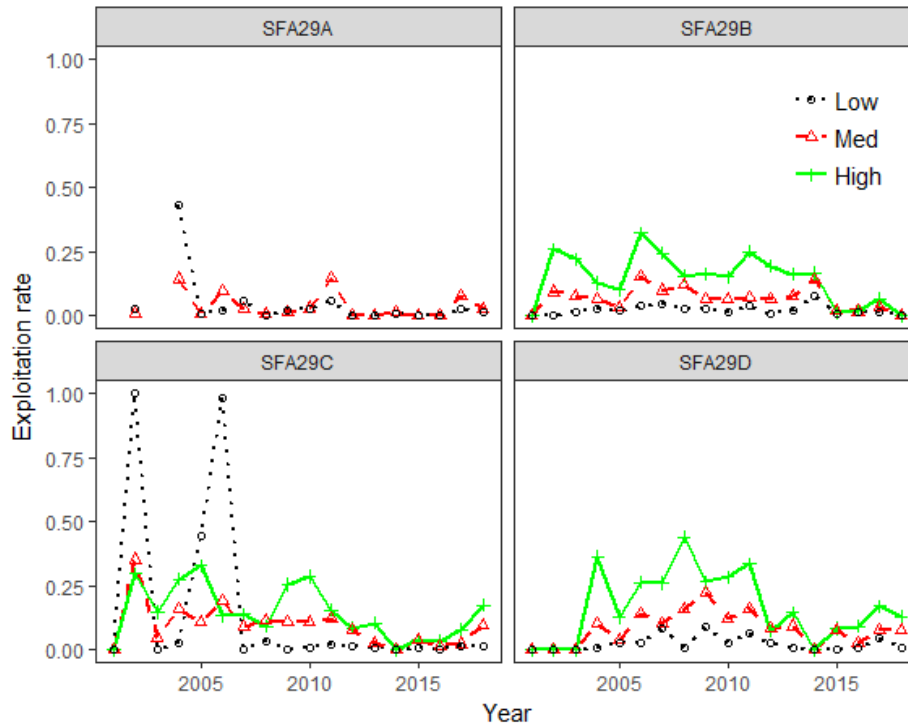


Figure 6. Model estimate of exploitation by Low [0, 0.3) category (black circles), Medium [0.3, 0.6) category (red triangles), and High [0.6, 1.0) category (green crosses) habitat suitability probabilities in SFA 29 West from 2001 to 2018.

Indicators of the Stock Status

The index associated with stock productivity for the DFO precautionary approach for SFA 29 West is commercial biomass density (t/km^2) in the High habitat suitability areas of Subareas B, C, and D (Figure 7). Lower Reference Points (LRPs) for Subareas B, C, and D were established in the fall of 2015, and Upper Stock Reference Points (USRs) were established in the fall of 2016. There are no reference points for Subareas A and E. There is no High habitat suitability in Subarea A, so the stock productivity index is provided for the Medium habitat suitability area of Subarea A (Figure 7).

In 2018, Subarea A commercial biomass density was 1.08 t/km^2 in the Low and 1.89 t/km^2 in the Medium habitat, an increase from the 2017 biomass density in both habitat categories. Commercial biomass density in Subarea B increased in all habitat categories. In 2018, commercial biomass density in the High habitat category of Subarea B was 3.19 t/km^2 , which is above the USR of 2.24 t/km^2 . Commercial biomass density in Subarea C decreased in all habitat categories. Commercial biomass density in the High habitat category of Subarea C was 3.02 t/km^2 in 2018, which is above the USR of 2.82 t/km^2 . Commercial biomass density in Subarea D increased in the Low habitat and remained similar in the Medium and High habitat categories. Commercial biomass density in the High category of Subarea D in 2018 was 4.02 t/km^2 , which is above the USR of 2.6 t/km^2 .

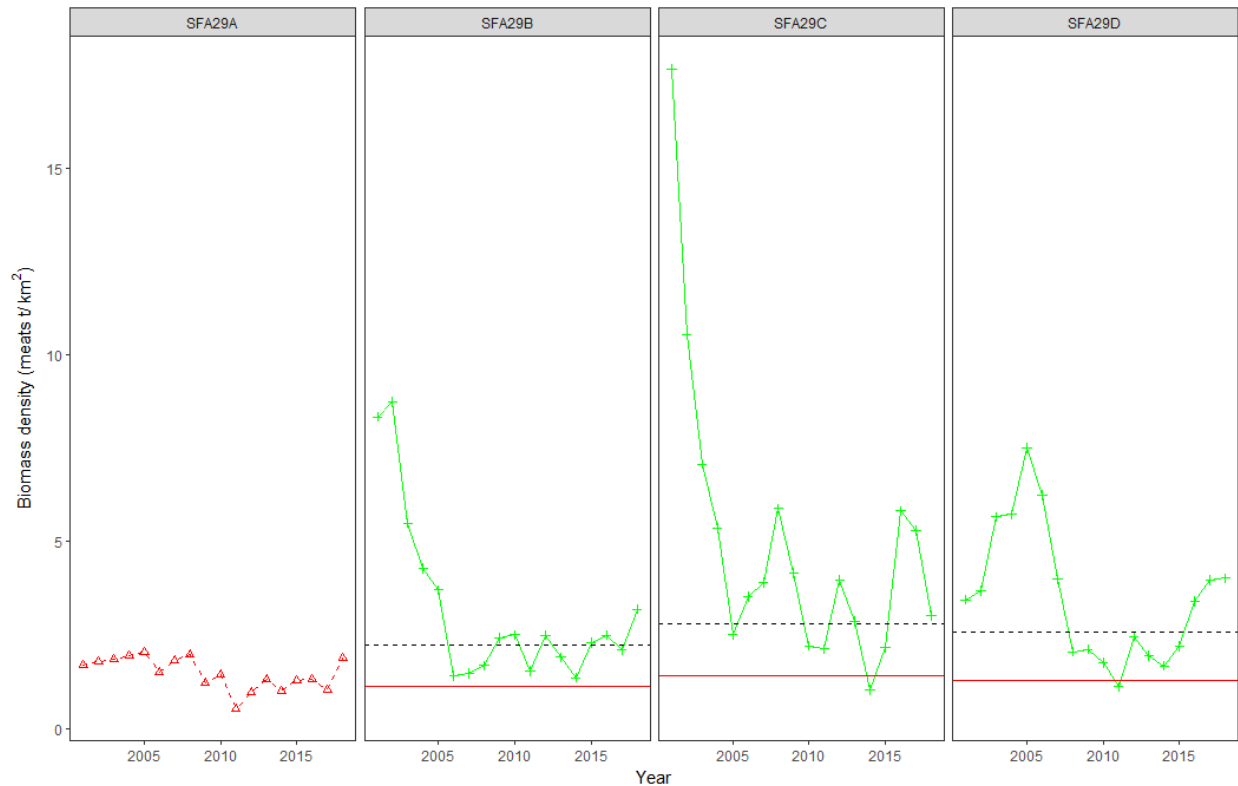


Figure 7. Commercial biomass densities (t/km^2) in SFA 29 West. In Subarea A the Medium suitability category is shown, while the High suitability categories are shown for Subareas B, C, and D. The Lower Reference Points (LRPs) are indicated by the solid (red) line and Upper Stock References (USRs) indicated by the dashed (black) line for Subareas B, C, and D. The LRP and USRs are 1.12 t/km^2 and 2.24 t/km^2 Subarea B, 1.41 t/km^2 and 2.82 t/km^2 for Subarea C, and 1.3 t/km^2 and 2.6 t/km^2 for Subarea D.

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Natural mortality

In all modeled subareas, the natural mortality (instantaneous) model estimates were above their respective long-term medians (2001-2017). In 2018, the estimated natural mortality for Subarea A was 0.4, an increase from 2017 (0.31). In Subarea B, the natural mortality estimate declined from 0.27 in 2017 to 0.23 in 2018. The estimated 2018 natural mortality in Subarea C (0.58) was significantly higher than the long-term median (0.13) but lower than observed in 2017 (0.67). In Subarea D, the natural mortality estimate in 2018 was 0.29, which is above the long-term median (0.15), but represents a decline from the past two years (0.46 in 2017 and 0.44 in 2016). During the 2018 research survey of SFA 29 West, live scallops were assessed in Subareas C and D for visual signs of disease or weakening; however, no diseased or weakened scallops were observed.

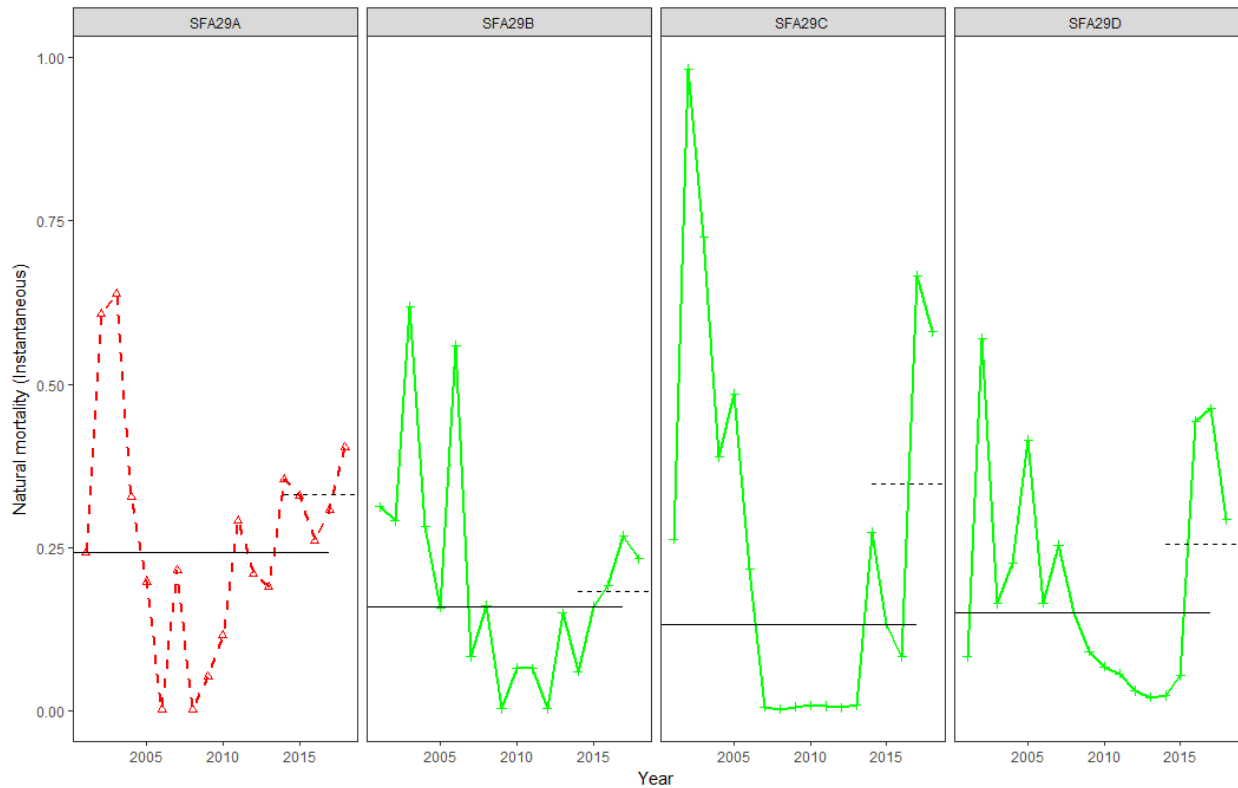


Figure 8. Modeled natural mortality (instantaneous rate) in SFA 29 West. In Subarea A the Medium suitability category is shown, while the High suitability categories are shown for Subareas B, C, and D. The 5-year (2014-2018) mean natural mortality is indicated by the dashed black line and the long-term median (2001-2017) is indicated by the solid black line.

Harvest Level Scenarios for 2019

Catch scenarios for 2019 assume current year (2018) estimates of condition and growth, estimates of observed recruit abundance, and the mean of natural mortality estimates from the last 5 years (2014 to 2018) within each subarea. In Subarea C, the 5-year mean natural mortality (0.35) used for the 2019 projections is 40% lower than the mortality estimate for 2018. If natural mortality continues to remain high in 2019, the biomass for Subarea C for 2019 is expected to be overestimated.

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Catch, exploitation, percent change in commercial biomass, probability of biomass decline, and the probability of exceeding the reference points were determined from the model for a range of potential catches, and these are presented as catch scenario tables for Subareas A–D in Tables 1–4.

There is no assessment model for Subarea E. In this subarea, abundance of commercial and recruit sized Scallop decreased in 2018, relative to 2017. The 2018 catch rate in Subarea E was 15.1 kg/h for the FB Fleet, and due to *Privacy Act* considerations, catch rate data for the EoB Fleet cannot be reported. The commercial fleet landed 12.8 t against a TAC of 20 t in 2018.

For Subarea A, biomass declines are predicted, even if no catch is taken in 2019. This is partially due to the elevated natural mortality in the subarea (> 0.2 since 2011) and the continued low levels of recruitment.

An example of how to interpret the catch scenarios in Tables 1–4 is presented using Table 2 for Subarea B. In this subarea, a catch of 38 t corresponds to an exploitation of 0.06 in the High habitat category, and is projected to result in a 15.4% biomass increase in the High habitat category. The probability of a biomass increase in the High habitat category is 0.61. The model predicts an increase in biomass, for all of Subarea B, of 15.5%; the associated probability of biomass increase for all of Subarea B is 0.67. After 38 t of catch is removed, the probability of being above the LRP is 0.96, and the probability of being above the USR is 0.79.

Table 1. Catch scenario table for SFA 29 West Subarea A to evaluate 2019 total subarea catch levels in terms of exploitation (e), expected changes in biomass (%), and probability (Pr.) of biomass increase. Note, Subarea A has no High suitability habitat.

Catch (t)	Medium Habitat Suitability Category			Whole Subarea	
	e	Expected % Change	Pr. Increase	Expected % Change	Pr. Increase
0	0	-21.0	0.31	-16.8	0.30
6	0.02	-21.6	0.30	-17.6	0.29
13	0.05	-22.7	0.29	-18.4	0.28
19	0.07	-23.7	0.28	-19.2	0.27
26	0.09	-24.9	0.27	-20.1	0.26
32	0.12	-25.9	0.27	-21.1	0.25
38	0.14	-27.2	0.26	-22.0	0.24
45	0.16	-28.1	0.25	-23.0	0.23
51	0.18	-29.1	0.24	-23.9	0.22
57	0.20	-30.7	0.23	-25.2	0.21

Table 2. Catch scenario table for SFA 29 West Subarea B to evaluate 2019 total subarea catch levels in terms of exploitation (e), expected changes in biomass (%), probability (Pr.) of biomass increase, and probability of being above the Lower Reference Point (LRP: 1.12 t/km²) and Upper Stock Reference (USR: 2.24 t/km²).

Catch (t)	High Habitat Suitability Category				Whole Subarea		
	e	Expected % Change	Pr. Increase	Pr. > LRP	Pr. > USR	Expected % Change	Pr. Increase
0	0	22.5	0.65	0.97	0.81	18.3	0.70
13	0.02	20.9	0.64	0.97	0.81	17.4	0.69
26	0.04	18.0	0.62	0.96	0.80	16.3	0.68
38	0.06	15.4	0.61	0.96	0.79	15.5	0.67
51	0.08	13.5	0.59	0.96	0.79	14.4	0.66
64	0.10	10.9	0.58	0.96	0.77	13.1	0.65
77	0.12	8.8	0.56	0.95	0.76	12.3	0.64

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Catch (t)	High Habitat Suitability Category					Whole Subarea	
	<i>e</i>	Expected % Change	Pr. Increase	Pr. > LRP	Pr. > USR	Expected % Change	Pr. Increase
90	0.14	6.4	0.55	0.95	0.76	11.0	0.62
103	0.16	4.2	0.53	0.95	0.74	10.3	0.62
115	0.18	1.8	0.51	0.95	0.73	9.0	0.60

Table 3. Catch scenario table for SFA 29 West Subarea C to evaluate 2019 total subarea catch levels in terms of exploitation (*e*), expected changes in biomass (%), probability (*Pr.*) of biomass increase, and probability of being above the lower reference point (LRP: 1.41 t/km²) and upper stock reference (USR: 2.82 t/km²).

Catch (t)	High Habitat Suitability Category					Whole Subarea	
	<i>e</i>	Expected % Change	Pr. Increase	Pr. > LRP	Pr. > USR	Expected % Change	Pr. Increase
0	0	12.6	0.56	0.84	0.60	34.8	0.77
6	0.02	10.6	0.55	0.84	0.59	33.5	0.76
12	0.04	8.3	0.54	0.83	0.58	31.7	0.75
17	0.06	6.5	0.53	0.83	0.57	30.5	0.74
23	0.08	3.9	0.52	0.82	0.56	28.1	0.73
29	0.10	2.2	0.51	0.82	0.55	26.8	0.72
35	0.12	-0.5	0.50	0.81	0.54	25.2	0.71
41	0.14	-2.6	0.49	0.80	0.53	23.2	0.70
47	0.16	-4.5	0.48	0.80	0.52	21.7	0.69
52	0.18	-6.2	0.47	0.79	0.51	20.3	0.67

Table 4. Catch scenario table for SFA 29 West Subarea D to evaluate 2019 total subarea catch levels in terms of exploitation (*e*), expected changes in biomass (%), probability (*Pr.*) of biomass increase, and probability of being above the lower reference point (LRP: 1.3 t/km²) and upper stock reference (USR: 2.6 t/km²).

Catch (t)	High Habitat Suitability Category					Whole Subarea	
	<i>e</i>	Expected % Change	Pr. Increase	Pr. > LRP	Pr. > USR	Expected % Change	Pr. Increase
0	0	18.8	0.65	0.98	0.85	-18.2	0.26
13	0.02	17.0	0.63	0.98	0.85	-18.7	0.26
25	0.04	14.7	0.62	0.98	0.84	-19.5	0.25
38	0.06	12.8	0.60	0.97	0.83	-20.1	0.24
50	0.08	10.6	0.59	0.97	0.82	-21.1	0.23
63	0.10	8.6	0.57	0.97	0.82	-21.5	0.22
75	0.12	6.4	0.55	0.97	0.81	-22.2	0.21
88	0.14	4.1	0.53	0.97	0.80	-23.1	0.20
101	0.16	1.9	0.52	0.97	0.79	-23.7	0.20
113	0.18	-0.3	0.50	0.96	0.78	-24.6	0.19

Ecosystem Considerations

Lobster Catch in the Fishery

In 2018, there were 34 active vessels in the fishery, 388 observed tows (73 EoB Fleet and 315 FB Fleet), 27 observed days (5 EoB Fleet and 22 FB Fleet) and 6 trips observed (1 EoB Fleet and 5 FB Fleet). It was estimated that 4,100 lobsters were caught during the SFA 29 West Scallop fishery in 2018 (Table 5). Using the average observed carapace length (85 mm) and average weight of a lobster (0.49 kg) caught in SFA 29 West in 2018, this corresponds to a

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weight of approximately 2.0 t, which is an increase from 2017 (1.1 t). The estimated number of lobster caught represents approximately 0.008% of the lobsters caught in the 2017/2018 Lobster Fishing Area (LFA) 34 lobster fishery and approximately 0.04% of the lobsters caught in the area of LFA 34 corresponding to SFA 29 West. In 2018, there were no observed trips in Subarea B and C, so there are no lobster estimates for that area. Subarea E had the highest lobster bycatch estimate at 3,035 lobsters, followed by Subarea A at 848 lobsters.

Trends in lobster catches by the lobster fishery in the SFA 29 West area as a whole are not indicative of an area that has been adversely affected by the scallop fishery since 2001.

Table 5. Estimated total numbers of lobsters caught in the Scallop fishery (Full Bay and East of Baccaro Fleets combined) for 2016–2018 based upon observer data. DI (%) refers to the percentage of dead or injured lobsters. Dash (-) indicates no observer coverage. NA refers to not applicable.

Year	Area	Observer data			Fishery	Estimated	
		No. lobsters	DI (%)	Meats (t)	Meats (t)	No. lobsters	No. DI
2016	A	-	-	-	0	-	-
	B	-	-	-	16.6	-	-
	C	212	17	6.0	15.5	547	96
	D	-	-	-	34.5	-	-
	E	162	22	1.0	9.5	1,481	329
	Total	374	NA	7.0	76.1	2,031	425
2017	A	78	29	2.3	13.2	441	128
	B	155	19	3.5	21.7	955	179
	C	21	20	2.4	26.3	228	46
	D	2	0	1.2	84.5	141	0
	E	-	-	-	0.1	0	0
	Total	256	NA	9.5	145.8	1,765	350
2018	A	444	54	4.7	8.7	848	461
	B	-	-	-	0.01	-	-
	C	-	-	-	47.3	-	-
	D	6	0	1.9	68.6	217	0
	E	332	58	1.4	12.8	3,035	1,765
	Total	782		8.0	137.41	4,100	2,226

Other Catch in the Fishery

The discard rates of all species in the 2018 Scallop fishery are presented in Table 6. Most species are within ranges of discards observed in previous years. The following species had discard rates higher than had been previously observed: Alligatorfish, Eelpout, unidentified crustaceans, and White Hake (Table 6). The discard rates reported for the 2017 Scallop fishery were underestimated for all species when reported in DFO (2018) and the corrected values are updated in Table 7. In 2017, the following species had discard rates higher than had been observed in previous years: Atlantic Rock Crab, Brill (or Windowpane), jellyfishes, Monkfish, Mussels, Sea Raven, Silver Hake, and whelks. For data prior to 2017, see Sameoto et al. (2015) and DFO (2016, 2017).

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Table 6. Inshore Scallop discard rates for bycatch species in SFA 29 West for 2018. Discard rates are the weight of discards (kg) observed divided by the weight of Scallops (kg, meats) landed during the observed trips. Only species that were caught in 2018 are shown.

Species	Rate	Species	Rate	Species	Rate
Alligatorfish	<0.001	Lemonweed	0.022	Shorthorn Sculpin	<0.001
American Lobster	0.137	Little, Winter Skate	0.019	Sponges	0.034
Atlantic Rock Crab	0.039	Longhorn Sculpin	0.017	Starfish	0.005
Brittle Star	<0.001	Monkfish	0.104	Striped Atlantic Wolffish	<0.001
Cephalopoda Class	<0.001	Mussel	0.014	Unident. Crustaceans	<0.001
Clam	<0.001	Ocean Pout	<0.001	Whelks	0.004
Eelpout	<0.001	Sea Potato	<0.001	White Hake	<0.001
Haddock	<0.001	Sea Raven	0.033	Winter Flounder	0.023
Hermit Crab	0.004	Sea Scallop	0.443	Witch Flounder	<0.001
Jonah Crab	0.158	Seaweed	0.015	Yellowtail Flounder	<0.001

Table 7. Updated inshore Scallop discard rates for bycatch species in SFA 29 West for 2017. Discard rates are the weight of discards (kg) observed divided by the weight of Scallops (kg, meats) landed during the observed trips. Only species that were caught in 2017 are shown.

Species	Rate	Species	Rate	Species	Rate
American Lobster	0.055	Jellyfishes	0.005	Silver Hake	0.001
American Plaice	0.002	Jonah Crab	0.129	Sponges	0.179
Atlantic Rock Crab	0.497	Lemonweed	<0.001	Starfish	0.185
Barnacles	0.006	Little, Winter Skate	0.032	Toad Crab	0.002
Brill/Windowpane	<0.001	Longhorn Sculpin	0.007	Unidentified Bivalves	<0.001
Brittle Star	<0.001	Monkfish	0.110	Unidentified Sculpins	<0.001
Cephalopoda (Class).	<0.001	Ocean Pout	<0.001	Whelks	0.949
Clams	0.242	Sea Cucumbers	0.012	Winter Flounder	0.007
Cod	<0.001	Sea Raven	0.439	Witch Flounder	0.001
Mussels	0.059	Sea Scallop	1.307	Yellowtail Flounder	<0.001
Hermit Crabs	0.003				

Conclusions

In 2018, commercial biomass densities in Subareas B, C, and D were considered to be in the Healthy Zone. Indications for Subarea E are that the population is neither increasing nor decreasing significantly at the current level of removals. For Subarea A, biomass declines are predicted, even if no catch is taken in 2019.

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Appendix

Table A.1. Commercial Scallop fishery landings, Total Allowable Catch (TAC), and landings for Food, Social and Ceremonial purposes (FSC) by First Nations (meats, t) for Scallop Fishing Area (SFA) 29 West from 2012 to 2018. The TACs for Subareas A and E are sometimes combined. Dash (-) indicates no catch. Asterisk (*) indicates preliminary data.

Year	Subarea	TAC (t)	Landings (t)	FSC (t)	Total Landings (t)
2012	A	25.0	1.0	-	1.0
	E		18.0	-	18.0
	B	60.0	76.8	4.2	81.0
	C	45.0	39.8	0.03	39.8
	D	30.0	31.7	0.4	32.2
	Total	160.0	167.3	4.7	172.0
2013	A		0.9	-	0.9
	E	35.0	13.5	-	13.5
	B	75.0	82.6	4.9	87.5
	C	25.0	18.3	-	18.3
	D	35.0	38.8	-	38.8
	Total	170.0	154.1	4.9	159.0
2014	A		3.0	-	3.0
	E	45.0	27.3	-	27.3
	B	90.0	98.1	5.3	103.4
	C	0.0	-	-	-
	D	0.0	-	-	-
	Total	135.0	128.4	5.3	133.7
2015	A	0	-	-	-
	E	27.0	27.3	0.4	27.7
	B	15.0	14.9	0.7	15.6
	C	15.0	13.2	1.4	14.6
	D	30.0	29.0	3.7	32.7
	Total	87.0	84.4	6.2	90.6
2016	A	0.0	-	-	-
	E	25.0	9.5	-	9.5
	B	15.0	16.6	-	16.6
	C	15.0	14.9	0.6	15.5
	D	20.0	31.5	3.0	34.5
	Total	75.0	72.5	3.6	76.1
2017	A	15.0	13.2	-	13.2
	E	20.0	0.1	-	0.1
	B	29.0	21.7	-	21.7
	C	30.0	26.3	-	26.3
	D	46.0	74.6	9.9	84.5
	Total	140.0	135.9	9.9	145.8
2018*	A	10.0	8.7	-	8.7
	E	20.0	12.8	-	12.8
	B	0.0	0.01	-	0.01
	C	50.0	47.3	-	47.3
	D	50.0	55.5	13.1	68.6
	Total	130.0	124.3	13.1	137.4

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