



ASSESSMENT OF SCALLOPS (*PLACOPECTEN MAGELLANICUS*) IN SCALLOP PRODUCTION AREAS 1 TO 6 IN THE BAY OF FUNDY

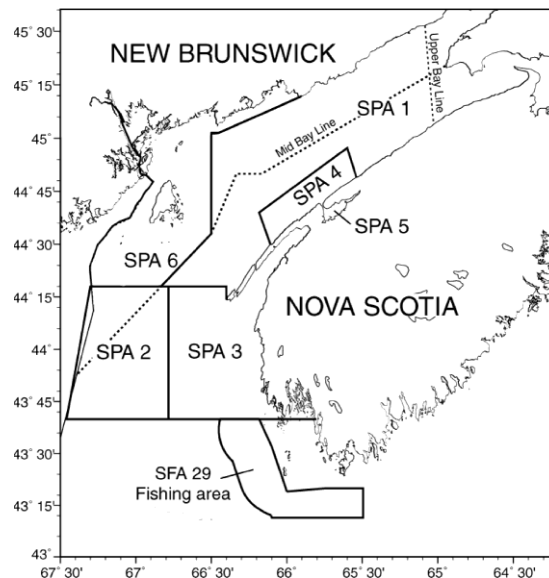
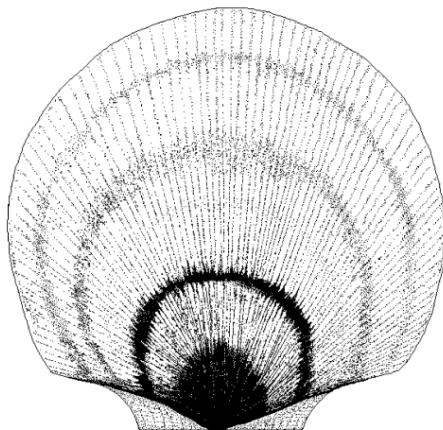


Figure 1. Scallop Production Areas (SPAs) in the Bay of Fundy. Refer to full detail map in Appendix 1 for place names.

Context

The Bay of Fundy area is fished by three scallop fleets: the Full Bay Fleet, the Mid Bay Fleet, and the Upper Bay Fleet. Full Bay licensed holders are permitted to fish throughout the Bay of Fundy. Mid Bay license holders have access to all areas north of the Mid Bay line. Upper Bay licence holders are restricted to the upper reaches of the bay. The fishery has been managed using limited entry, gear size limits, seasonal closures, minimum shell height, and meat count. The gear width limit is 5.5 m with a ring size of not less than 82 mm inside diameter. Quotas were introduced in 1997. The Full Bay Fleet operates under an Individual Transferable Quota (ITQ) system, while the Mid and Upper Bay fleets fish with competitive quotas. Total Allowable Catches (TACs) are set and landings are reported in terms of meat weights (adductor muscles).

Scallops in Scallop Production Areas (SPAs) 1 to 6 in the Bay of Fundy are assessed according to a framework conducted in 2002 (DFO 2002).

This Science Advisory Report is from the 13-14 November 2012 Assessment of Bay of Fundy Scallop. The objectives of this meeting were to: (1) assess the status of scallop stocks by SPA taking into account available commercial and survey information, and (2) evaluate the consequences of different harvest levels for the 2012/2013 fishery and interim harvest levels for the 2013/2014 fishery using the established reference exploitation rate and percent change in biomass. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>.

SUMMARY

General

- Problems with the projections from the population models for Scallop Production Area (SPA) 1A, 1B, 3 and 4 were addressed in the 2011 assessment. This year's assessment advice uses these improved models.
- Changes were made to the survey gear used in the 2012 scallop survey in SPAs 1A, 1B, 3, and 4. A comparative survey was conducted to address the impact of the new gear on estimates of catch. The results of the comparative work indicate that the two gears were comparable and no conversion factor was required.
- As in previous assessments, future catch levels have been evaluated for the modelled production areas in terms of a reference exploitation rate of 0.15, and whether or not the proposed catch would result in a decrease in biomass from the current year.
- Forecasts of biomass for 2012/2013 and 2013/2014 require estimates of expected biomass growth (and condition) and natural mortality for future years. These estimates are based on current conditions and, therefore, may not reflect actual changes over the next two years.

SPA 1A

- Total landings were 208.6 t during the 2011/2012 fishing season against a Total Allowable Catch (TAC) of 200 t. An interim TAC of 100 t was set for 2012/2013.
- Commercial catch rate in 2011/2012 was 12.1 kg/h, below the long-term median (1995/96 to 2010/11) of 15.5 kg/h. Recruitment to the fishery has been low and the numbers of commercial size scallops has been fished down. Recruitment is expected to be at low levels for at least the next two years.
- The condition factor (meat weight for 100 mm shell) increased in all subareas of SPA 1A in 2012. All subareas in 1A are above the long-term median (1997 to 2011) for condition.
- The survey index of commercial scallop numbers decreased by 9% from 2011 to 2012, while the biomass index in 2012 increased by 9% from 2011 due to the overall increase in condition.
- Population biomass estimated by the model was 1,277 t (meats) in 2012, up slightly from the estimate of 1,179 t for 2011 and approximately equal to the median biomass of 1,222 t (1997 to 2011).
- A catch of 200 t for 2012/2013 is projected to correspond to the reference exploitation rate (0.15) and is predicted to result in a 9.4% decline in biomass for 2013.

SPA 1B

- Total landings of all fleets in 2011/2012 were 303.4 t against a TAC of 300 t. An interim TAC of 100 t was set for the Full Bay Fleet for the 2012/2013 fishing season.
- Commercial catch rates for the Full Bay and Mid Bay fleets have been stable over the past couple seasons in Scallop Fishing Areas (SFA) 28B and 28C. Catch rates in SFA 28D have declined for Upper Bay and Full Bay fleets.
- The condition factor increased in all subareas of SPA 1B in 2012, and now all subareas are above the long-term median.

- The survey index of commercial scallop numbers decreased or stayed the same in all parts of SPA 1B except Scots Bay, which increased.
- Commercial biomass from the survey in 2012 has remained similar to estimates from 2011 for SFAs 28B and 28D, and decreased by 35% in SFA 28C. Recruit biomass from the survey increased in SFAs 28B and 28C.
- Population biomass estimated by the model was 1,743 t (meats) in 2012, essentially unchanged from the estimate of 1,781 t for 2011 and below the median biomass of 1,870 t (1997 to 2011).
- A catch of 325 t for 2012/2013 is projected to correspond to the reference exploitation rate (0.15) and is predicted to result in a 0.1% increase in biomass for 2013.

SPA 2

- This area is considered to be marginal habitat for scallops and is not monitored regularly. SPA 2 was last assessed in 2006 (DFO 2007).

SPA 3

- Total landings for the 2011/2012 fishing season were 264.5 t against a TAC of 300 t. An interim TAC of 100 t was set for the 2012/2013 fishing season, and 145.2 t had been landed by 15 October 2012 when the fishery was closed.
- For the 2011/2012 fishing season only, SPA 3 was subdivided into 3A and 3B. The TAC in 3A was set at 225 t and 261.7 t was landed. The TAC in 3B was set at 75 t and 2.9 t was landed.
- Commercial catch rates for St. Mary's Bay declined 21% in 2012, while June catch rates for the Brier/Lurcher area in 3A and 3A+3B increased by 17 and 13%, respectively. The increase in catch rate from October 2011 to October 2012 was 19%.
- As in 2011, the 2012 survey area outside of St. Mary's Bay was partitioned according to areas being regularly or lightly fished since 2002, and separate survey indices have been developed for these areas, referred to as "Inside" and "Outside."
- The condition factor decreased in St. Mary's Bay from 2010 to 2012, but it increased in the "Inside" and "Outside" areas in 2012.
- Survey indices indicate increases in commercial biomass for all subareas of SPA 3. In St. Mary's Bay and the "Outside" area, there was an increase in survey index of commercial scallop numbers, while there was a slight decrease in the "Inside" area.
- As in 2011, the 2012 population model only used survey data from St. Mary's Bay and the "Inside" area.
- Population biomass estimated by the model was 1,039 t (meats) in 2012, an increase of 14% from the estimate of 914 t for 2011, which was the median biomass from 1996 to 2011.
- A catch of 175 t for 2012/2013 is projected to correspond to the reference exploitation rate (0.15) and is predicted to result in a 2.3% decline in biomass for 2013.
- The population model underestimated the biomass for 2011 and 2012. If condition increases above levels seen this year, the model may once again underestimate the population biomass and a TAC above 175 t would result in a lower probability of decline in biomass than predicted. It is unlikely that this increased productivity can be sustained over the next few years without increased levels of recruitment.

SPA 4

- Total landings in the 2011/2012 fishing season were 114.1 t against a TAC of 120 t. An interim TAC of 100 t was set for the 2012/2013 fishing season.
- Commercial catch rate in 2011/2012 decreased from the 2010/2011 rate and is at the long-term median.
- The condition factor declined from 2011 to 2012.
- The survey index of commercial scallop numbers in 2012 indicates minimal change from 2011, while survey biomass of commercial size scallops increased by 9%. The survey estimate of recruits is the lowest in the time series, and low levels of recruitment to the fishery will probably continue for at least the next two years.
- Population biomass estimated by the model was 716 t (meats) in 2012, an increase of 5% from the estimate of 681 t for 2011 and just below the median biomass of 754 t (1983 to 2011).
- A catch of 110 t for 2012/2013 is projected to correspond to the reference exploitation rate of 0.15 and is predicted to result in a 12.7% decline in biomass for 2013.

SPA 5

- Total landings in 2012 were 6.0 t against a TAC of 10 t.
- Commercial catch rate decreased by almost half from 2011 and is below the long-term median. The commercial catch rate is now the fourth lowest since 1997.
- The annual survey was discontinued as of 2009 in this SPA.
- Since 2007, the average annual catch has been 6.8 t and the average catch rate has been 16.0 kg/h.

SPA 6

- Total landings for Full Bay and Mid Bay fleets in the 2011/2012 fishing season were 55.5 t against a TAC of 140 t.
- Mid Bay catch rates in 2011/2012 decreased in all subareas of SPA 6, and are below their long-term average catch rates. The largest decreases were observed for subareas 6B (7.0 kg/h versus an average of 10.1 kg/h) and 6D (7.6 kg/h versus an average of 14.4 kg/h).
- The condition factor increased in all subareas of SPA 6 from 2011 to 2012.
- Survey indices of commercial scallop numbers decreased by 46% and 15% in subareas 6A and 6B, respectively, and biomass decreased by 19% and 7%. In subarea 6C, there were increases in both numbers (36%) and biomass (46%).
- Shell height frequencies suggest that recruitment will be low for at least the next year.
- This year, commercial catch rates have decreased for all areas and are currently lower than their long-term averages further suggesting that biomass in SPA 6 has declined.

BACKGROUND

The Bay of Fundy scallop fisheries have a long and well documented history of peer reviewed assessments, and the assessment approach has been accepted in previous advisory meetings. Problems with the projections from the population models were identified in the 2009 assessment (DFO 2010) and were addressed in the 2011 assessment. Changes were also made to the definition of the survey area and alignment of catch and survey timing in the model for SPA 3 (Smith et al. 2012). This year's assessment advice uses these improved models and redefined survey area.

Changes were made to the survey gear used in the 2012 scallop survey in Scallop Production Areas (SPAs) 1A, 1B, 3, and 4. In the past, the survey had been conducted with 4-gang Digby drags with rubber washers and without teeth. This was replaced in 2012 with 9-gang steel Miracle gear, with flat tire chafers, and 2 inch teeth. A comparative survey was conducted concurrent to the 2012 Bay of Fundy survey to address the impact of the new gear on estimates of catch. The results of the comparative work indicate that the two gears were comparable in catch for both commercial and recruit size scallops and no conversion factor was required. For details on the comparative survey and the analyses see Smith et al. (2013). The Digby survey gear was retained for the survey in SPA 6 in 2012 due to difficult fishing conditions and the patchiness of the scallop distribution in that area.

As in previous assessments, future catch levels have been evaluated for the modelled production areas in terms of a reference exploitation rate of 0.15, and whether or not the proposed catch would result in a decrease in biomass from the current year. The main goal for this approach was to promote stability in the population biomass until recruitment levels had improved. Recruitment success seems to be determined more by favourable environmental conditions than stock size for scallops in this area. The definition and implementation of reference points and harvest control rules is the subject of ongoing discussions between the industry and the department.

ASSESSMENT, CONCLUSIONS AND ADVICE

SPA 1 - Inner/Upper Bay of Fundy

SPA 1 covers most of the mid to inner Bay of Fundy. Since 2002, it has been managed as two separate areas: SPA 1A and SPA 1B (Appendix 1). The Full Bay Fleet can fish throughout SPA 1A and 1B. However, the other fleets are restricted to SPA 1B, the Mid Bay Fleet fishing only north of the Mid Bay line, and the Upper Bay Fleet fishing only east of the Upper Bay line.

SPA 1A - Southwest Bay of Fundy

Fishery

Total landings were 208.6 t during the 2011/2012 fishing season against a Total Allowable Catch (TAC) of 200 t (Figure 2). An interim TAC of 100 t was set for the 2012/2013 fishing season. As of the Quota Cap report of 9 November 2012, 2.2 t had been landed from SPA 1A against this interim TAC.

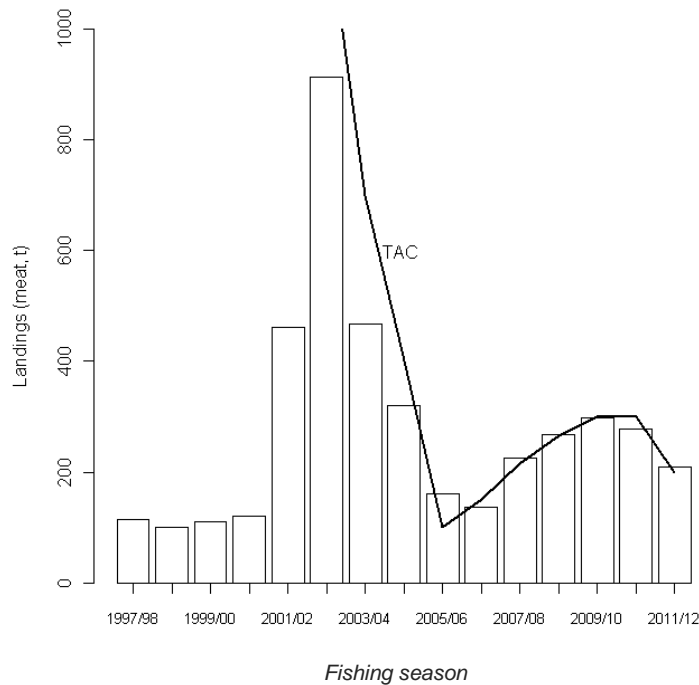


Figure 2. Scallop landings and TAC (meats, t) in SPA 1A.

Assessment

Catch rates declined from 2001/02 to 2005/06 as the strong 1998 year-class, which was mainly located in the 8 to 16 mile area, was fished out. Commercial catch rate in 2011/2012 was 12.1 kg/h, below the long-term median (1995/96 to 2010/11) of 15.5 kg/h. Effort also decreased in 2011/2012 but was still above the long-term median.

Since the above average 1998 year-class recruited to the fishery in this area, recruitment to the fishery has been low and the numbers of commercial size scallops has been fished down. Recruitment is expected to be at low levels for at least the next two years. The survey index of commercial scallop numbers decreased by 9% from 2011 to 2012, while the biomass index in 2012 increased by 9% from 2011 due to the overall increase in condition. The condition factor (meat weight for 100 mm shell) increased in all subareas of SPA 1A in 2012. All subareas in 1A are above the long-term median (1997 to 2011) for condition.

The population model described in Smith and Lundy (2002), with modifications described in Smith et al. (2012), was applied to the combined survey biomass data for the three surveys in this area along with the catch data over the 1997–2012 period. Population biomass estimated by the model was 1,277 t (meats) in 2012, up slightly from the estimate of 1,179 t for 2011 and approximately equal to the median biomass of 1,222 t (1997 to 2011).

Conclusions and Advice

A catch of 200 t for 2012/2013 is projected to correspond to the reference exploitation rate (0.15) and is predicted to result in a 9.4% decline in biomass for 2013 (Table 1). The probability that biomass would decline at this level of catch is 0.57. An evaluation of the model's prediction performance since 2005 indicates that model estimates have fallen within the 50% credible interval of the prediction from the previous year.

Table 1. Decision table for SPA 1A to evaluate 2012/2013 catch levels in terms of expected changes in biomass (% change) and probability of decline (Pr decline). Posterior median exploitation rates are given (e). Potential catches in 2013/2014 are evaluated in terms of the posterior probability of exceeding exploitation rate of 0.15.

2012/2013				$Pr(e_{2013/2014} \geq 0.15)$					
Catch (t)	e	% Change	Pr (decline)	0.1	0.2	0.3	0.4	0.5	0.6
100	0.07	0.4	0.50	68	101	134	171	213	264
150	0.11	-3.8	0.53	65	97	129	163	204	255
200	0.15	-9.4	0.57	60	90	122	155	193	242
250	0.18	-12.9	0.60	58	88	116	150	188	237
300	0.22	-16.8	0.62	54	81	110	142	180	228
350	0.25	-21.9	0.66	50	77	104	134	169	215

SPA 1B - Northern/Upper Bay of Fundy

Fishery

In 2007/2008, a TAC sharing formula for the three fleets in SPA 1B was implemented that allocated shares by the three subareas: Scallop Fishing Area (SFA) 28B (excluding SPA 6), SFA 28C, and SFA 28D (Appendix 1). Total landings for all fleets in 2011/2012 were 303.4 t against a TAC of 300 t. In the 2011/2012 season, the Full Bay Fleet landed 160.91 t against a TAC of 152.25 t (Figure 3).

Landings for the Mid Bay Fleet were 102.58 t (TAC 107.16 t) in total for SFA 28B and SFA 28C. The TAC for SFA 28C and 28D was 40.59 for the Upper Bay Fleet, and 39.9 t were landed in 2012. An interim TAC of 100 t was set for the Full Bay Fleet for the 2012/2013 fishing season. As of the Quota Cap report of 9 November 2012, 43.8 t had been landed by the Full Bay Fleet.

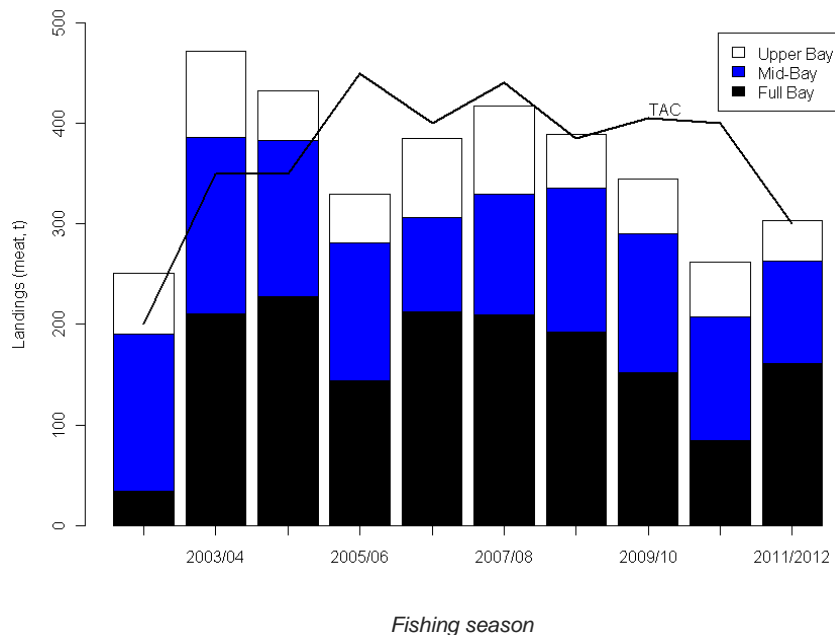


Figure 3. Scallop landings and TAC (meats, t) in SPA 1B (for all fleets). TAC for all fleets in SPA 1B introduced in 2002.

Assessment

Commercial catch rates for the Full Bay and Mid Bay fleets have been stable over the past couple seasons in SFAs 28B and 28C. Catch rates in SFA 28D have declined for Upper Bay and Full Bay fleets.

The survey index of commercial scallop numbers decreased or stayed the same in all parts of SPA 1B except Scots Bay, which increased. Commercial biomass from the survey in 2012 has remained similar to estimates from 2011 for SFAs 28B and 28D, and decreased by 35% in SFA 28C. Recruit biomass from the survey increased in SFAs 28B and 28C.

The condition factor (meat weight at 100 mm shell height) used in the growth models declined in all of the subareas of SPA 1B from 2008 to 2011, then increased in 2012, and now all subareas are above the long-term median.

The population model described in Smith and Lundy (2002), with modifications described in Smith et al. (2012), was applied to the combined survey biomass data and the catch data over the 1997–2012 period. Population biomass estimated by the model was 1,743 t (meats) in 2012, essentially unchanged from the estimate of 1,781 t for 2011 and below the median biomass of 1,870 t (1997 to 2011).

Conclusions and Advice

A catch of 325 t for 2012/2013 is projected to correspond to the reference exploitation rate (0.15) and is predicted to result in a 0.1% increase in biomass for 2013 (Table 2). The probability that biomass would increase at this level of catch is 0.50. An evaluation of the model's prediction performance since 2005 indicates that model estimates have fallen within the 50% credible interval of the prediction from the previous year.

Table 2. Decision table for SPA 1B to evaluate 2012/2013 catch levels in terms of expected changes in biomass (% change) and probability of decline (*Pr* decline). Posterior median exploitation rates are given (*e*). Potential catches in 2013/2014 are evaluated in terms of the posterior probability of exceeding exploitation rate of 0.15.

2012/2013				$Pr(e_{2013/2014} \geq 0.15)$					
Catch (t)	<i>e</i>	% Change	<i>Pr</i> (decline)	0.1	0.2	0.3	0.4	0.5	0.6
100	0.05	15.0	0.41	114	170	226	288	362	450
150	0.07	11.2	0.43	112	167	222	282	352	443
200	0.09	8.1	0.45	108	163	218	277	344	432
250	0.12	4.6	0.47	104	157	211	269	335	421
300	0.14	1.6	0.49	101	152	204	262	328	409
325	0.15	0.1	0.50	100	151	202	260	325	406
350	0.17	-1.8	0.51	98	149	200	254	319	402
400	0.19	-5.0	0.53	93	143	193	247	309	389
450	0.22	-9.1	0.56	92	137	183	235	296	375

SPA 3 - Brier Island, Lurcher Shoal, and St. Mary's Bay

Fishery

Although scallops can be found throughout most of this area, there are three main beds; those around Lurcher Shoal, below Brier Island, and in St. Mary's Bay. St. Mary's Bay (formerly SPA 7) was included with SPA 3 for a combined TAC starting in 1999.

Total landings for the 2011/2012 fishing season were 264.5 t against a TAC of 300 t. An interim TAC of 100 t was set for the 2012/2013 fishing season, and 145.2 t had been landed by 15 October 2012 when the fishery was closed.

For the 2011/2012 fishing season only, SPA 3 was subdivided into 3A and 3B. These two areas were managed separately to reflect the different fishing intensities and different densities observed in the survey. Area 3A consisted of St. Mary's Bay and the eastern portion of Brier/Lurcher. Area 3B was the western portion of Brier/Lurcher. The TAC in 3A was set at 225 t and 261.7 t was landed. The TAC in 3B was set at 75 t and 2.9 t was landed.

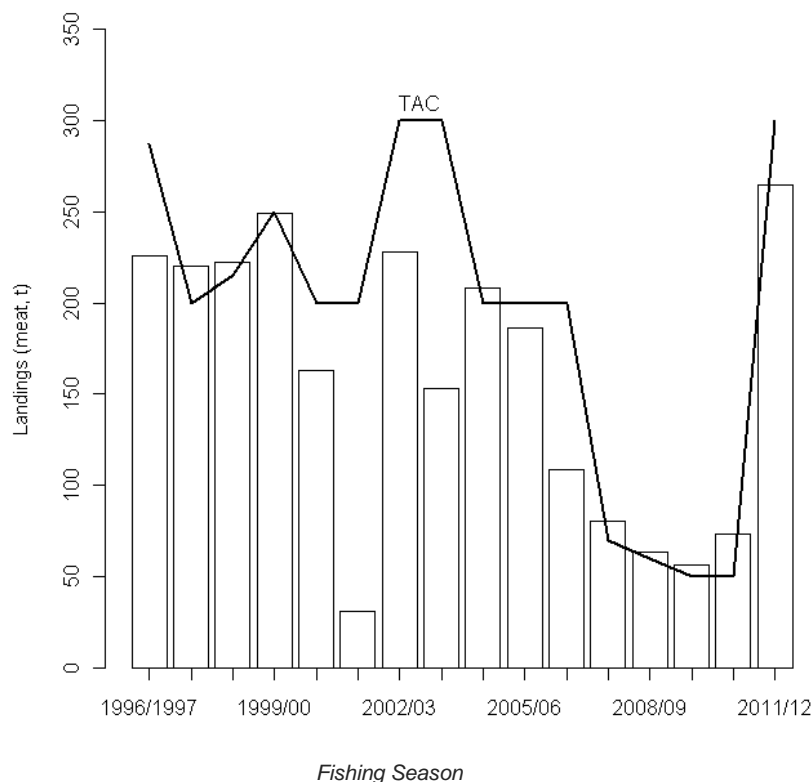


Figure 4. Scallop landings and TAC (meats, t) in SPA 3.

Assessment

Commercial catch rates in 2012 for St. Mary's Bay declined 21% in 2012, while June catch rates for the Brier/Lurcher area in 3A and 3A+3B increased by 17 and 13%, respectively. The increase in catch rate from October 2011 to October 2012 was 19%.

As in 2011, the 2012 survey area outside of St. Mary's Bay was partitioned according to areas being regularly or lightly fished since 2002, and separate survey indices have been developed for these areas, referred to as "Inside" and "Outside." Survey indices indicate increases in commercial biomass for all subareas of SPA 3. In St. Mary's Bay and the "Outside" area, there was an increase in survey index of commercial scallop numbers, while there was a slight decrease in the "Inside" area. The condition factor decreased in St. Mary's Bay from 2010 to 2012, but it increased in the "Inside" and "Outside" areas in 2012. There were no areas of high recruit density, but recruits were spread throughout the St. Mary's Bay and "Inside" area.

The population model described in Smith and Lundy (2002), with modifications described in Smith et al. (2012), was applied to the survey biomass data and the catch data over the 1996–2012 period. As in 2011, the 2012 population model only used survey data from St. Mary's Bay and the "Inside" area. Population biomass estimated by the model was 1,039 t (meats) in 2012, an increase of 14% from the estimate of 914 t for 2011, which was the median biomass from 1996 to 2011.

Conclusions and Advice

A catch of 175 t for 2012/2013 is projected to correspond to the reference exploitation rate (0.15) and is predicted to result in a 2.3% decline in biomass for 2013. This catch includes the 145.2 t already landed in the fall 2012 fishery. The probability that biomass would decline at this catch is 0.51.

The population model underestimated the median biomass for 2011 and 2012. While all of the previous model estimates fall within the 50% credible interval of the prediction from the previous year, the estimated biomass for 2012 was greater than the 75th percentile of the predicted biomass using data up to 2011 and the actual catch. Landings of 260 t in 2011/2012 did not result in a decrease in biomass, in large part due to higher than expected productivity (increased condition), as recruitment continues to be low. The mean shell height of the commercial size scallops has been increasing, which suggests that the observed increase in productivity is based on condition rather than the growth potential. If condition increases above levels seen this year, the model may once again underestimate the population biomass and a TAC above 175 t would result in a lower probability of decline in biomass than predicted. It is unlikely that this increased productivity can be sustained over the next few years without increased levels of recruitment.

Table 3. Decision table for SPA 3 to evaluate 2012/2013 catch levels in terms of expected changes in biomass (% change) and probability of decline (Pr decline). Posterior median exploitation rates are given (e). Potential catches in 2013/2014 are evaluated in terms of the posterior probability of exceeding exploitation rate of 0.15.

2012/2013				$Pr(e_{2013/2014} \geq 0.15)$					
Catch (t)	e	% Change	Pr (decline)	0.1	0.2	0.3	0.4	0.5	0.6
150	0.12	-0.1	0.50	59	87	117	148	183	230
175	0.15	- 2.3	0.51	57	86	114	145	180	228
200	0.16	-4.1	0.53	56	82	109	140	177	223
225	0.19	-6.6	0.55	54	81	109	139	176	220
250	0.21	-9.5	0.57	52	78	105	135	170	213
275	0.23	-12.9	0.59	51	76	103	131	165	206
300	0.25	-16.4	0.62	48	73	97	125	158	200
325	0.27	-17.8	0.64	47	71	95	122	153	194
350	0.30	-22.6	0.66	45	68	90	116	145	184

SPA 4 - Digby

Fishery

The SPA 4 fishing season extends from 1 October to 30 April. Total landings in 2011/2012 fishing season were 114.1 t against a TAC of 120 t (Figure 5). An interim TAC of 100 t was set for the 2012/2013 fishing season. As of the Quota Cap report of 9 November 2012, 38.5 t had been landed from SPA 4 against this interim TAC.

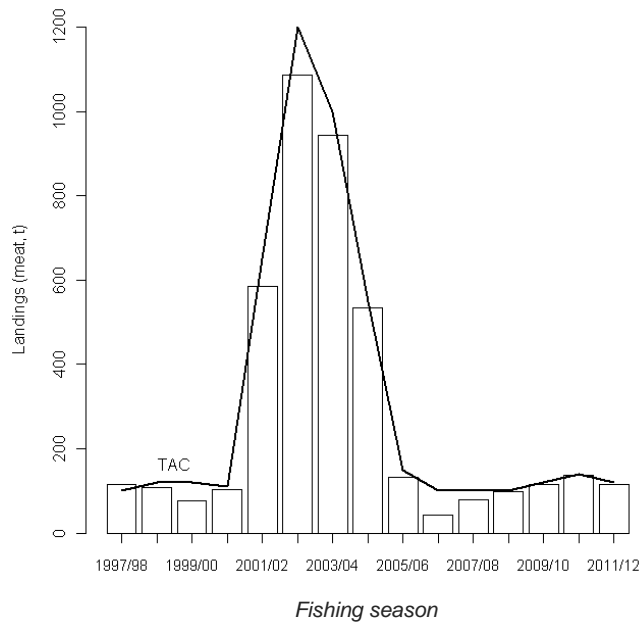


Figure 5. Scallop landings and TAC (meats, t) in SPA 4.

Assessment

Commercial catch rates declined after the above average 1998 year-class recruited to the fishery but have been either relatively stable or slightly increasing since 2005/2006. Commercial catch rate in 2011/2012 (16.4 kg/h) decreased from the 2010/2011 rate (18.7 kg/h) and is at the long-term median.

The survey index of commercial scallop numbers in 2012 indicates minimal change from 2011, while survey biomass of commercial size scallops increased by 9%. The survey estimate for mean number of recruits decreased from 2011 and is the lowest in the 31 year time series. Given the trends in the pre-recruit estimates, low levels of recruitment to the fishery will probably continue for at least the next two years.

The condition factor (meat weight at 100 mm shell height) used in the growth models decreased from 2008 to 2010, increased in 2011, and declined from 2011 to 2012.

The population model described in Smith and Lundy (2002), with modifications described in Smith et al. (2012), was applied to the survey biomass data and the catch data over the 1983–2012 period. Estimated recruit biomass from the model (9 t) is the second lowest since 1983. Population biomass estimated by the model was 716 t (meats) in 2012, an increase of 5% from the estimate of 681 t for 2011 and just below the median biomass of 754 t (1983 to 2011).

Conclusions and Advice

A catch of 110 t for 2012/2013 is projected to correspond to the reference exploitation rate (0.15) and is predicted to result in a 12.7% decline in biomass for 2013 (Table 4). The probability that biomass will decline at this catch is 0.60. An evaluation of the model's prediction performance since 2005 indicates that model estimates have fallen within the 50% credible interval of the prediction from the previous year.

Table 4. Decision table for SPA 4 to evaluate 2012/2013 catch levels in terms of expected changes in biomass (% change) and probability of decline (*Pr* decline). Posterior median exploitation rates are given (*e*). Potential catches in 2013/2014 are evaluated in terms of the posterior probability of exceeding exploitation rate of 0.15.

2012/2013				$Pr(e_{2013/2014} \geq 0.15)$					
Catch (t)	<i>e</i>	% Change	<i>Pr</i> (decline)	0.1	0.2	0.3	0.4	0.5	0.6
100	0.14	-12.2	0.60	35	50	65	81	99	123
110	0.15	-12.7	0.60	35	50	65	80	98	121
120	0.16	-14.6	0.62	35	50	64	79	97	118
140	0.19	-16.7	0.64	33	47	62	76	94	116
160	0.22	-20.4	0.67	32	46	59	74	90	113
180	0.24	-23.2	0.69	30	43	57	71	88	109
200	0.27	-25.6	0.71	29	42	55	69	85	107

SPA 5 - Annapolis Basin

Fishery

The fishery in the Annapolis Basin (SPA 5) is only open to the Full Bay Fleet with the fishing season occurring between 2 January and 31 March. In recent years, landings have varied between 2 and 20 t (Figure 6). Total landings in 2012 were 6.0 t against a TAC of 10 t.

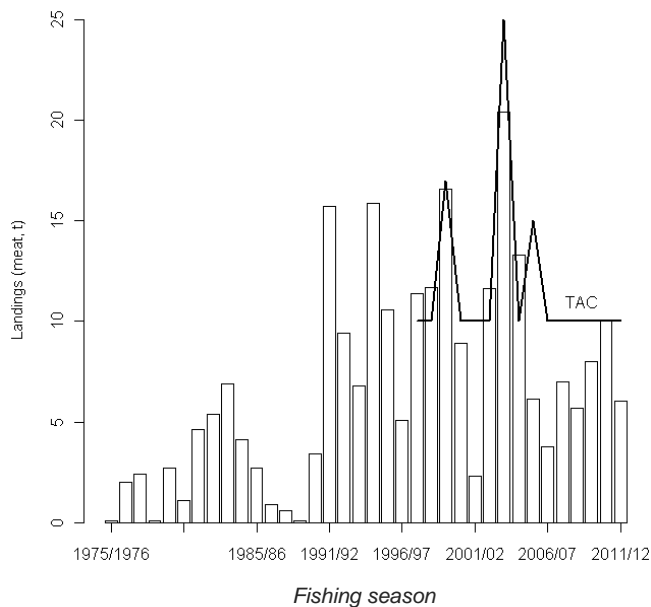


Figure 6. Scallop landings and TAC (meats, t) in SPA 5.

Assessment

Commercial catch rate (11.4 kg/h) decreased by almost half from 2011 (19.9 kg/h) and is below the long-term median (18.6 kg/h).

The annual survey was discontinued as of 2009 in this SPA, and the sampling effort was redirected to the other areas in the Bay of Fundy.

Conclusions and Advice

The commercial catch rate is now the fourth lowest since 1997 (6.6 kg/h). Since 2007, the average annual catch has been 6.8 t and the average catch rate has been 16.0 kg/h.

SPA 6 - Grand Manan and Southwest New Brunswick

Fishery

The areas around Grand Manan and off southwest New Brunswick are designated SPA 6. This area is further divided into subareas 6A, 6B, 6C, and 6D (Appendix 1). Total landings for Full Bay and Mod Bay fleets in the 2011/2012 fishing season were 55.5 t against a TAC of 140 t (Figure 7).

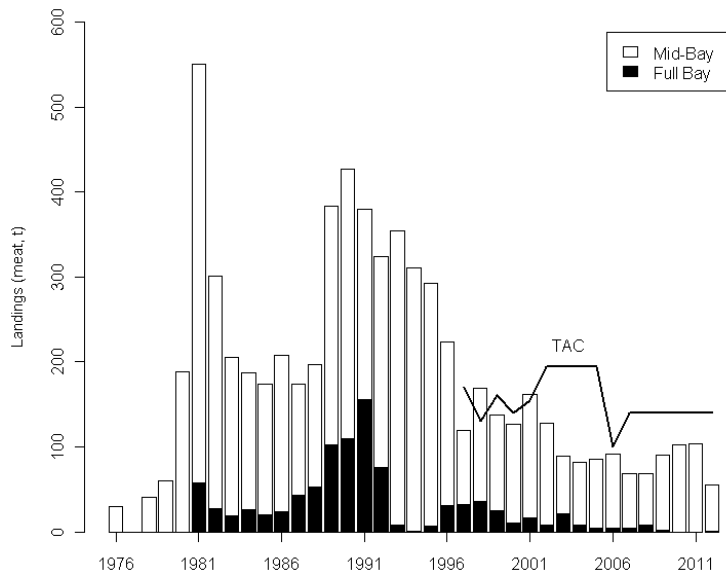


Figure 7. Scallop landings by fleet and TAC (meats, t) in SPA 6.

There was less than 1 t of landings recorded for the Full Bay Fleet against a quota of 21 t. This fleet has not caught its quota for the last 7 years as it has directed its effort to the other SFAs.

The 2012 quota for the Mid Bay Fleet was 119 t. Mid Bay landings for 2012 by area were 11.4 t, 13.8 t, 24.5 t, and 5.1 t for subareas 6A, 6B, 6C, and 6D, respectively.

Assessment

Mid Bay catch rates in 2011/2012 decreased in all subareas of SPA 6, and are below their long-term average catch rates (time series up to and including 2011). The largest decreases were observed for subareas 6B (7.0 kg/h versus an average of 10.1 kg/h) and 6D (7.6 kg/h versus an average of 14.4 kg/h).

Survey indices of commercial scallop numbers decreased by 46% and 15% in subareas 6A and 6B, respectively, and biomass decreased by 19% and 7%. In subarea 6C there were increases in both numbers (36%) and biomass (46%). Shell height frequencies suggest that recruitment will be low for at least the next year. The condition factor (meat weight at 100 mm shell height)

used in the growth models declined from 2010 to 2011 but increased in all subareas of SPA 6 from 2011 to 2012.

Conclusions and Advice

In Smith et al. (2012), concern was expressed over declines in survey indices, while noting that commercial catch rates did not appear to indicate similar changes. This year, commercial catch rates have decreased for all areas and are currently lower than their long-term averages further suggesting that biomass in SPA 6 has declined.

Sources of Uncertainty

Forecasts of biomass for 2012/2013 and 2013/2014 require estimates of expected biomass growth (and condition) and natural mortality for future years. These estimates are based on current conditions and, therefore, may not reflect actual changes over the next two years.

Estimates of growth and condition are based on survey to survey differences and do not explicitly account for seasonal increases or decreases between surveys. This may be part of the explanation for model underestimates (or overestimates).

In some SPAs (e.g. SPA 4), some commercial catch is being removed from near shore areas outside the survey strata. The impact of this on the assessment will be investigated further.

OTHER CONSIDERATIONS

Scallop removals accounted for in the assessment include landings from the inshore scallop fleets and Food Social and Ceremonial (FSC) catch, when applicable. Landed recreational and FSC catch by dip netting, diving, tongs, and hand is not recorded and, therefore, not available. Scallop discards by the scallop fishery were presented in Smith et al. (2012). For non-scallop fisheries where bycatch information is available, scallop discards were insignificant compared to discards from the inshore scallop fleet (Gavaris et al. 2010). There were no fisheries observer trips in the Bay of Fundy scallop fishery in 2011/2012. Refer to Sameoto and Glass (2012) for analysis of discards from the inshore scallop fishery.

SOURCES OF INFORMATION

This Science Advisory Report is from the 13-14 November 2012 Assessment of Bay of Fundy Scallop. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>.

DFO. 2002. Proceedings of a Maritimes Regional Advisory Process Meeting on SPA 1-4 Scallops. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2002/018: 19 pp.

DFO. 2007. Stock Assessment Report on Scallops (*Placopecten magellanicus*) in Scallop Production Areas 1 to 6 in the Bay of Fundy. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/013.

DFO. 2010. Assessment of Scallops (*Placopecten magellanicus*) in Scallop Production Areas 1 to 6 in the Bay of Fundy. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/017.

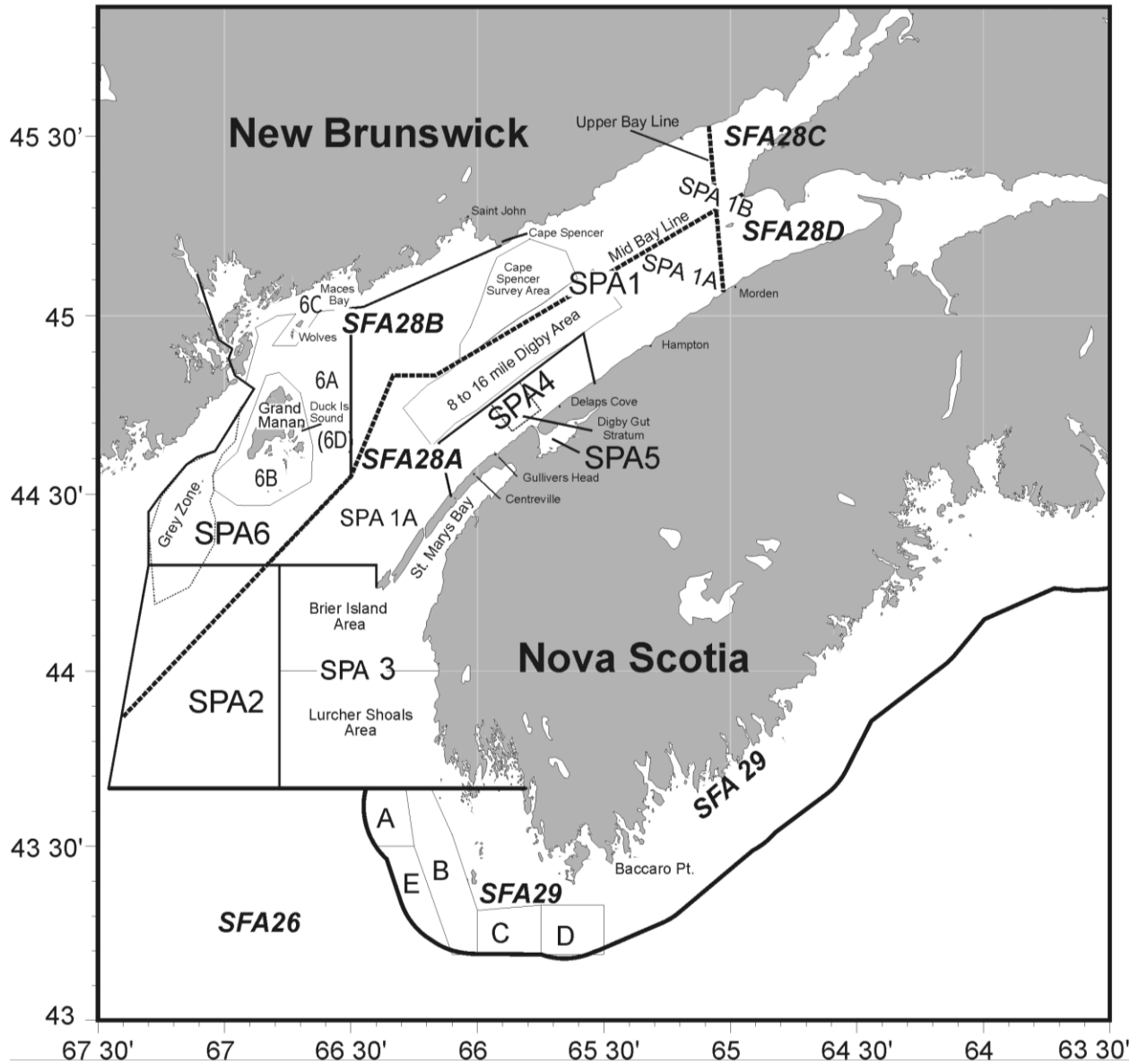
Gavaris, S., K. Clark, A. Hanke, C. Purchase, and J. Gale. 2010. Overview of Discards from Canadian Commercial Fisheries in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z for 2002–2006. Can. Tech. Rep. Fish. Aquat. Sci., 2873: vi + 112 pp.

Nasmith, L., B. Hubley, Smith, S.J., and A. Glass. 2013. Scallop Production Areas in the Bay of Fundy: Stock Status for 2012 and Forecast for 2013. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/004: vii + 104 p.

- Sameoto, J.A., and Glass, A. 2012. An Overview of Discards from the Canadian Inshore Scallop Fishery in SFA 28 and SFA 29 West for 2002 to 2009. Can. Tech. Rep. Fish. Aquat. Sci. 2979: vi + 39 p.
- Smith, S.J., Glass, A., Sameoto, J., Hubley, P.B., Reeves, A., and L. Nasmith. 2013. Comparison of catches from Digby and Miracle drag gear for scallop surveys in the Bay of Fundy. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/161: iv + 12 p.
- Smith, S.J., and M.J. Lundy. 2002. Scallop Production Area 4 in the Bay of Fundy: Stock Status and Forecast. DFO Can. Sci. Advis. Sec. Res. Doc. 2002/018.
- Smith, S.J., B. Hubley, L. Nasmith, J. Sameoto, H. Bourdages, and A. Glass. 2012. Scallop Production Areas in the Bay of Fundy: Stock Status for 2011 and Forecast for 2012. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/009.

APPENDIX 1

Map showing the locations and place names for inshore scallop grounds.



THIS REPORT IS AVAILABLE FROM THE:

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Aussi disponible en français :

*MPO 2013. Évaluation des stocks de pétoncles (*Placopecten magellanicus*) des zones de production de pétoncles 1 à 6 dans la baie de Fundy. Secr. can. de consult. sci. du MPO, Avis sci. 2013/001.*