



ASSESSMENT OF SCALLOPS (*PLACOPECTEN MAGELLANICUS*) IN SCALLOP FISHING AREA (SFA) 29 WEST OF LONGITUDE 65°30'W

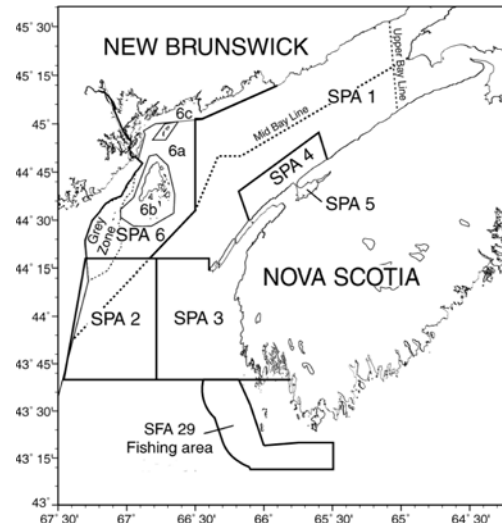
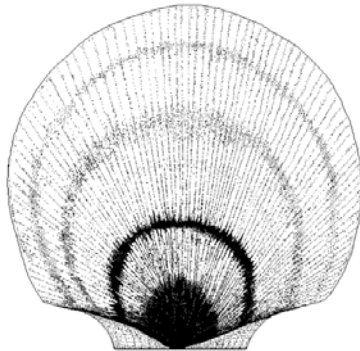


Figure 1. Location of the portion of SFA 29 west of longitude 65°30'W. Refer to full detail map in Appendix 1 for locations and place names.

Context:

Scallop Fishing Area (SFA) 29 encompasses a very large inshore area inside the 12-mile territorial sea, from the south of Yarmouth (latitude 43°40'N) to Cape North in Cape Breton. This report refers to only that portion of SFA 29 west of longitude 65°30'W continuing north to SPA 3 at latitude 43°40'N (Figure 1).

Prior to 1986, the Full Bay Scallop Fleet fished in this area. Following the 1986 inshore/offshore scallop fishing agreement, fishing by the Full Bay Fleet was restricted to north of latitude 43°40'N. A limited fishery by the Full Bay Fleet was granted from 1996–98. Access was again granted to this fleet in 2001 with a full at-sea monitoring program and with a condition of a post-season industry-funded survey. SFA 29 is within Lobster Fishing Area (LFA) 34 and, as a result, scallop fishers consulted with lobster fishers in the area to deal with potential conflicts. Lobster and bycatch of other species continue to be monitored in this fishery.

In 2002, the Minister of Fisheries and Oceans approved access to this area by the Full Bay Fleet and inshore east of Baccaro licence holders who are eligible to fish in SFA 29 west of longitude 65°30'W. SFA 29 inshore scallop licenses were historically restricted to east of Baccaro (east of longitude 65°30'W). A joint project agreement was signed with the fishing fleets, Natural Resources Canada, and Fisheries and Oceans Canada with all parties providing funds to conduct multi-beam acoustic mapping of the seafloor and other scientific work. A map showing bottom features for the entire area has been prepared and was distributed to the fishermen for the 2004 fishery. Work continues on analyzing surficial geology and the spatial distribution of scallops.

Advice on Total Allowable Catch (TAC) for this area has been provided annually and is based on survey estimates of abundance and commercial catch rates. There is no framework or reference points for the fishery in SFA 29 at this time.

SUMMARY

- This scallop fishery has taken place in the portion of Scallop Fishing Area (SFA) 29 west of longitude 65°30' W since 2001 and is currently conducted by two fleets: the Full Bay Fleet and a limited number of inshore East of Baccaro licence holders (i.e., East of Baccaro Fleet).
- During 2008, a total of 249 t (190 t Full Bay; 59 t East of Baccaro) was landed against a TAC of 250 t.
- The fishery in subareas A and E has been sporadic in the last two years and commercial catch rates in these areas appear to have increased from 2007 to 2008. In subarea B, commercial catch rates for the Full Bay fleet have declined by 19% since 2006, while the East of Baccaro fleet catch rates have remained stable. The Full Bay fleet commercial catch rates have been stable in subarea C over the last three years and the East of Baccaro fleet catch rates have increased from 2006 to 2008. Catch rates have been declining (31 to 34%) for both fleets in subarea D since 2005.
- Estimates from the combined daily commercial catch rate in 2007 and 2008 indicated that exploitation had decreased by up to one half in subarea B, remained stable in subarea C and possibly doubled in subarea D. Estimates were not possible for subarea A due to the small amounts of catch taken there.
- Catches of 1 year old scallops (shell heights ≤ 50 mm) in the 2007 survey were widely distributed with the highest densities in subarea A. With the possible exception of subarea D, these densities did not translate into high densities of two year olds in the 2008 survey.
- The survey index for commercial size scallops in subarea A indicated an increase in 2008 compared to 2007 but, given the patchy nature of the distribution of scallops in this subarea and the lack of recruitment observed over the time series, survey trends in subarea A may not reflect actual population trends.
- The survey index in subarea B has indicated a general decline in abundance since 2002 with little change in abundance after 2006. Recruitment continues to be low in this subarea.
- Since 2006, recruitment has continued to be low in subarea C with the Full Bay survey indicating a stable commercial size population and the East of Baccaro survey indicating increasing abundance over the same time period.
- The Full Bay survey index indicated an increase in the abundance of commercial size scallops from 2007 to 2008 in subarea D, while the East of Baccaro series showed a continued decline from 2005. Recruitment continues to be low since 2005 in both series.
- Catch level recommendations for the 2009 fishery were based on the interpretation of trends in the catch rate, survey and exploitation time series; subarea A: 10–20 t, subarea B: 60–80 t, subarea C: 60–80 t and subarea D: ≤ 85 t.
- Bycatch of lobster by the SFA 29 scallop fishery in 2008 was estimated at less than 0.1% of the weight of lobsters landed by the Lobster Fishing Area (LFA) 34 lobster fishery in the

SFA 29 area. The majority of the lobsters caught in the scallop fishery were released back into the water alive and uninjured.

BACKGROUND

Species Biology

The sea scallop (*Placopecten magellanicus*) occurs only in the northwest Atlantic Ocean from Virginia north to Labrador. Within this area, scallops are concentrated in persistent, geographically discrete aggregates or “beds”, many of which support valuable commercial fisheries. Scallops in different beds, and in different areas of large beds, show different growth rates and meat yields.

Unlike many commercial scallop species, the sea scallop has separate sexes. Male scallops develop a white gonad in the summer months, while female gonads are bright red. Eggs and sperm are released into the water and fertilization takes place in the sea. Spawning begins in late August to early September, and the larvae drift in the water for almost a month before settling to the bottom in October.

Rationale for Assessment

A meeting of the Regional Advisory Process was held 14 April 2009 at the Bedford Institute of Oceanography (BIO), in Dartmouth, Nova Scotia to review the 2008 fishery and assess the status of the scallop stock in SFA 29 in support of the management of the 2009 fishery. Participants included DFO scientists, fishery managers and representatives of the industry. Specifically, the meeting was called to provide TAC advice for SFA 29 scallop fisheries by subarea using analyses of catch rate and survey biomass trends. In addition, an assessment of the potential for bycatch, particularly lobster bycatch was also provided.

ASSESSMENT

Fishery

This scallop fishery has taken place in the portion of SFA 29 west of longitude 65°30' W since 2001. The Full Bay (FB) scallop fleet was the sole participant in 2001. Starting in 2002, the TAC was shared between the Full Bay Fleet and a limited number of inshore East of Baccaro licence holders who are eligible to fish in SFA 29 west of longitude 65°30' W (i.e., East of Baccaro (EoB) Fleet). Landings have ranged from 221 to 713 t (Figure 2). Low catches in 2003 were due to a short season caused by a delayed opening.

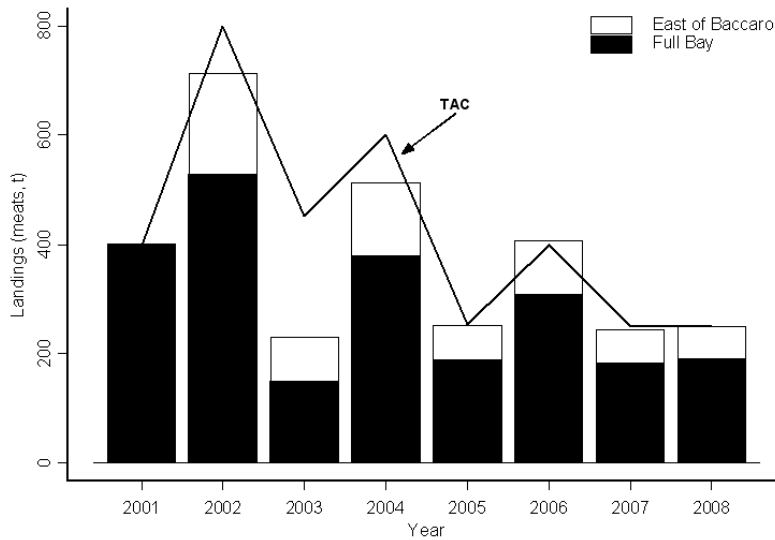


Figure 2. Scallop landings (meats, t) by fleet and total TAC for Scallop Fishing Area 29.

All subareas opened for the 2008 fishing season on June 23. Subarea D closed first (July 8 - FB, July 11 - EoB) with overruns of the TAC of 56% and 22% by Full Bay and East of Baccaro fleets, respectively (Table 1). The TACs for subarea C were also overrun (FB – 25%, EoB – 10%), and subarea C was closed to fishing on July 21 for the Full Bay fleet and July 23 for East of Baccaro. Two closed areas within subarea B were instituted for both fleets in response to lobster bycatch reports on July 26 and August 2 before the whole area was closed to the Full Bay fleet on August 9. Subareas A and E were closed to the Full Bay fleet on August 21 and the TAC was not reached in these areas or in subarea B. The fishery in subareas A, B and E were closed on September 16 for the East of Baccaro fleet with the TAC not being reached in any of these areas.

Table 1. Scallop landings (meats, t) and TACs for SFA 29.

Year	Subarea	Full Bay		East of Baccaro		Total	
		TAC	Landings	TAC	Landings	TAC	Landings
2007	29A	18.75 ¹	10.49	6.25 ¹	0.99	25 ¹	11.48
	29E		0.24				0.24
	29B	75.00	56.19	25.0	24.32	100	79.88
	29C	37.50	48.52	12.5	11.03	50	58.89
	29D	56.25	68.02	18.75	26.35	75	95.35
	Total	187.50	183.15	62.50	62.69	250	245.94
2008 ²	29A	7.5 ¹	3.05	2.5 ¹		10 ¹	3.05
	29E		0.65		0.44		1.09
	29B	82.5	44.65	27.5	20.75	110	65.40
	29C	33.75	42.05	11.25	13.35	45	54.40
	29D	63.75	99.37	21.25	26.02	85	125.39
	Total	187.5	189.77	62.50	59.54	250	249.33

¹ TAC for 29A and E combined.

² Preliminary landings.

Resource Assessment

The fishery in subareas A and E has been sporadic in the last two years and **commercial catch rates** in these areas appear to have increased from 2007 to 2008 (Figure 3). In subarea B, commercial catch rates for the Full Bay fleet have declined by 19% since 2006, while the East of

Baccaro fleet catch rates have remained stable. The Full Bay fleet commercial catch rates have been stable in subarea C over the last three years and the East of Baccaro fleet catch rates have increased from 2006 to 2008. Catch rates have been declining (31 to 34%) for both fleets in subarea D since 2005. Subarea D continues to have higher catch rates than the other subareas.

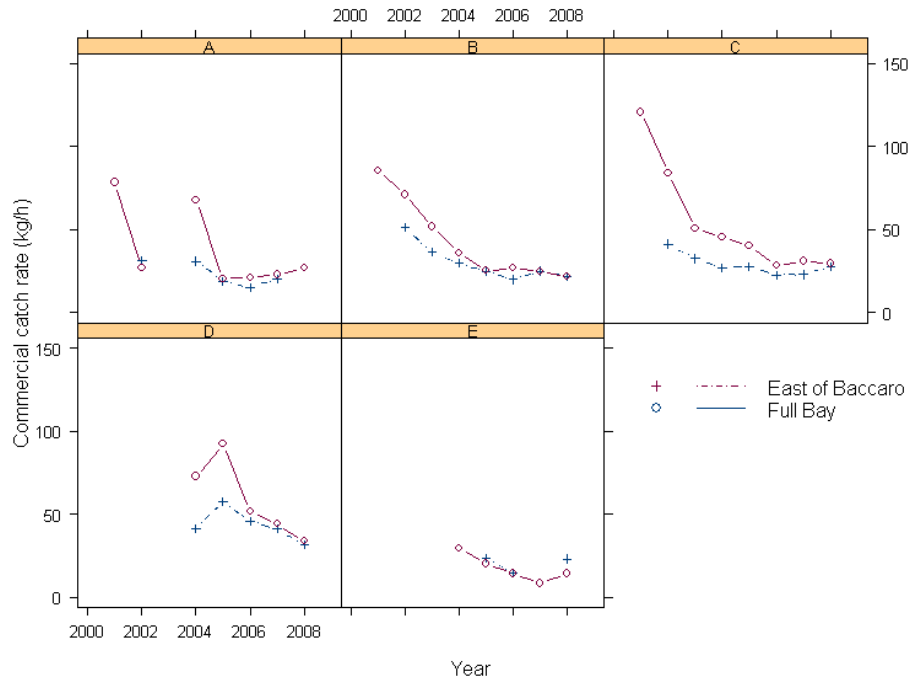


Figure 3. Mean commercial catch rate (kg/h) trends for SFA 29 scallop fishery for each subarea by fleet. Confidence intervals for annual catch rate estimates (not shown) ranged from $\pm 4\%$ to 236% of the annual mean with 90% of the confidence intervals $\leq 55\%$.

A depletion model was fit to the daily commercial catch rate data to estimate exploitation in each fishing season for 2002 to 2008. One of the main assumptions for this model is that all of the removals from a population during the season were only due to the fishery. Given the short season for this fishery, this assumption should be met. The estimates of initial biomass in a season and exploitation during the fishing season appear to be sensitive to the amount of area being fished. Based on records from the vessel monitoring systems (VMS), the area being fished has been consistent for subareas B, C and D from 2006 to 2008 and the depletion estimates appear to be more stable for most of these years. Fishing in subarea A has been consistently patchy and, as a result, the depletion model estimates do not appear to be reliable in this subarea.

Exploitation rates have varied between 0.08 and 0.17 in subarea B from 2006 to 2008 with gradual declines in daily catch rates over each of the seasons. The decline in daily catch rates in subarea C was the most rapid and associated exploitation rates range from 0.29 to 0.38. Estimates of initial biomass indicate a continual decline in biomass since 2005. However, when biomass is expressed on a per area fished basis, the population biomass appears to be stable over the last three years. The rate of decline in daily catch rates in subarea D was between those for subareas B and C. Relative exploitation rates increased from 0.12 in 2007 to 0.25 in 2008 coincident with a 31% increase in catch over the two years.

A post-season joint industry/departmental **research survey** has been conducted each year since 2001. During this time, there have been four industry vessels involved. In 2001, the survey was based upon a simple random sampling design over the whole area. From 2002 to 2004, subareas A–E were defined to be strata, with random sampling within strata. Subarea E has not been consistently covered in the survey due to time limitations; this subarea is considered to be marginal habitat for scallops and, as a result, has been less of a survey priority. In 2005, stratification was based upon the surficial bottom types identified from the multi-beam mapping and surficial geology groundtruth analysis in SFA 29. In 2006 and 2007, tows were allocated randomly to surficial strata within subareas. A new interpretation of the surficial geology introduced in 2008 that included information from side-scan sonar and seismic data was used to design the survey in 2008. Survey estimates from 2001 to 2008 have been modified to correspond to this new design.

Time trends for commercial size scallops (≥ 100 mm shell height) and recruits (90–99 mm shell height) are plotted in Figure 4. The survey index for commercial size scallops in subarea A indicated an increase in 2008 compared to 2007 even though no recruitment was observed in 2007. Given the patchy nature of the distribution of scallops in this subarea and the lack of recruitment observed over the time series, survey trends in subarea A may not reflect actual population trends.

The survey index in subarea B has indicated a general decline in abundance since 2002 with little change in abundance after 2006. Recruitment continues to be low in this subarea.

After an initial decline from 2001 to 2002, there appeared to be three stronger than average year-classes in subarea C that contributed little to changes in abundance of commercial size scallops until the decline from 2005 to 2006. This decline was picked up in both the Full Bay and East of Baccaro surveys. From 2006 to the present, recruitment has continued to be low with the Full Bay survey indicating a stable commercial size population and the East of Baccaro survey indicating increasing abundance over the same time period.

The strong year-class observed in the 2003 survey in subarea D and expected to recruit in 2004 did not appear to be as strong in the 2004 survey. However, both the Full Bay and East of Baccaro surveys identified a peak in abundance in 2005. The Full Bay survey index indicated an increase in the abundance of commercial size scallops from 2007 to 2008 while the East of Baccaro series showed a continual decline from 2005. Recruitment continues to be low since 2005 in both series.

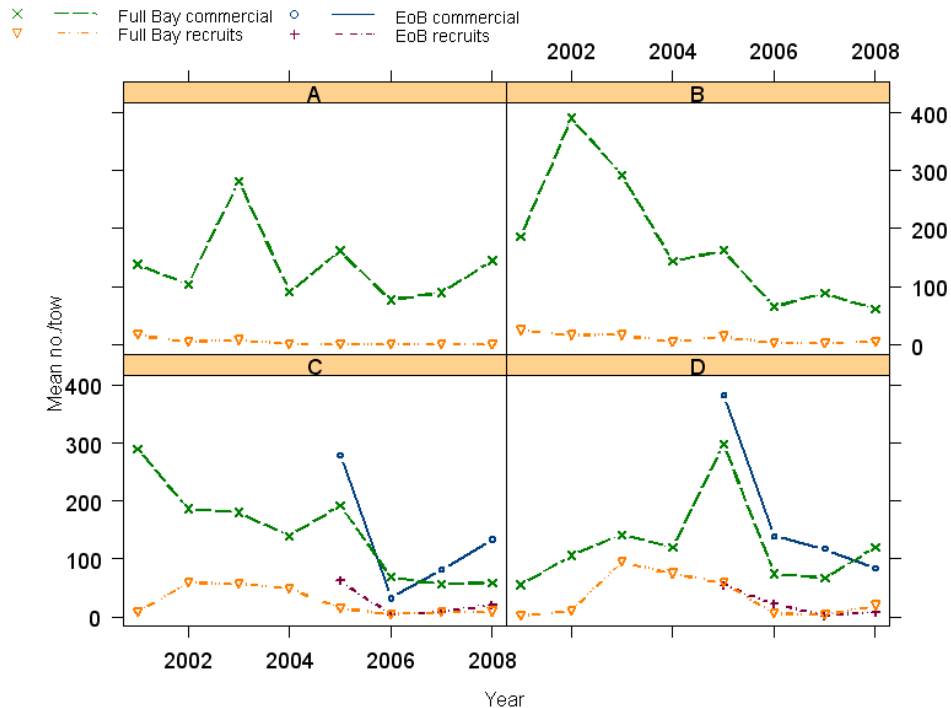


Figure 4. Annual trends of fully recruited (≥ 100 mm) and recruit (90–99 mm) size scallop mean number per tow from research surveys by subarea in SFA 29. Commercial-FB and Recruits-FB estimated from the Full Bay industry vessels: F/V Julie Ann Joan (2001–2003, 2005–2008) and F/V Branntelle (2004). Commercial-EoB and Recruits-EoB estimated from the East of Baccaro industry vessels: F/V Overton Bay (2005) and F/V Faith Alone (2006–2008).

In the 2007 survey, large numbers of scallops around one year old were observed in all of the subareas with the highest densities in subarea A. With the possible exception of subarea D, these densities did not translate into high densities of two year olds in the 2008 survey.

Bycatch

The mean numbers of **lobsters** per tow from the scallop survey was highest in subarea B at approximately 4 lobsters per tow (Figure 5). Subarea A had the next highest lobster catch rate (approximately 2.3 lobster/tow) followed by subarea C (1 or 2 lobsters per tow depending on survey), and subarea D (< 0.5 lobster/tow). The size of lobsters in the survey ranged from 30 mm carapace length (CL) to 230 mm CL, but most lobsters were between 50 and 120 mm CL and there was a strong mode at approximately 75 mm CL. The SFA 29 survey was conducted in September during 2001–2003 and in October during 2004–2008; the impact of survey timing on lobster bycatch is unknown.

Observer coverage for this fishery, i.e., the number of observed vessel days, is required to be equal to the number of active vessels. This level of coverage was attained in 2008 (63 days for 61 vessels). While all subareas receive observer coverage, emphasis was placed on subarea B where lobster bycatch has been a particular issue in the past (Figure 6).

Most lobsters caught during observed fishing trips were in subarea B similar to previous years (Figure 6). In subareas C and D, most tows had zero lobsters. Of the 1473 lobsters caught during observed trips as bycatch in 2008, 936 were classed as uninjured, 411 were injured, 116 were dead and the condition was not recorded for 10. The estimated total number of lobsters

caught as a bycatch during scallop fishing in SFA 29 was 4535 with an estimated weight of 2.3 t. This weight of lobsters would represent a small fraction (< 0.1%) of the lobsters landed by the LFA 34 lobster fleet in the area corresponding to SFA 29 in 2007/2008. The majority of the lobsters caught in the scallop fishery were released back into the water alive and uninjured.

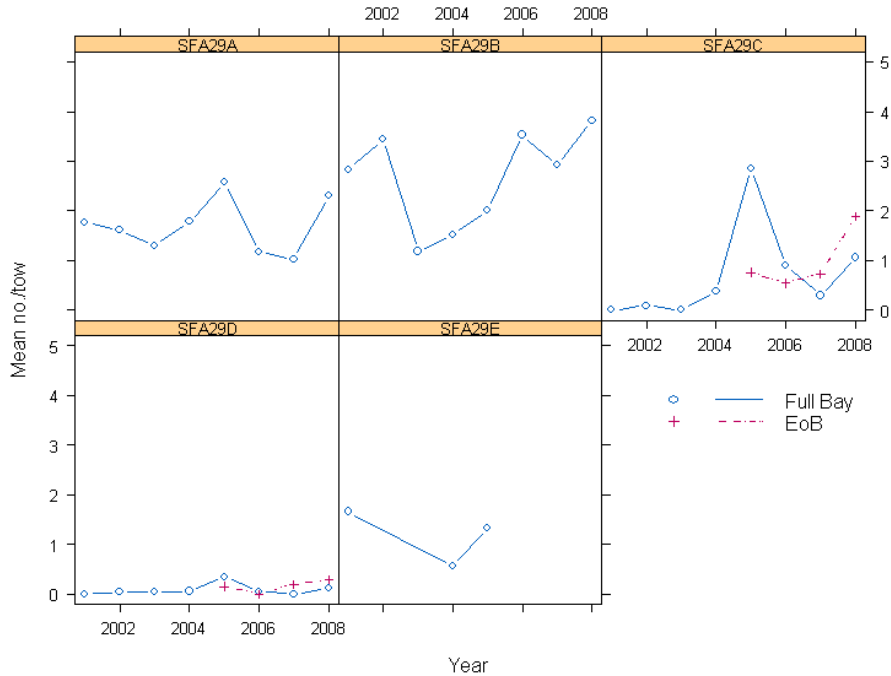


Figure 5. Mean number of lobsters per tow from annual scallop surveys of SFA 29.

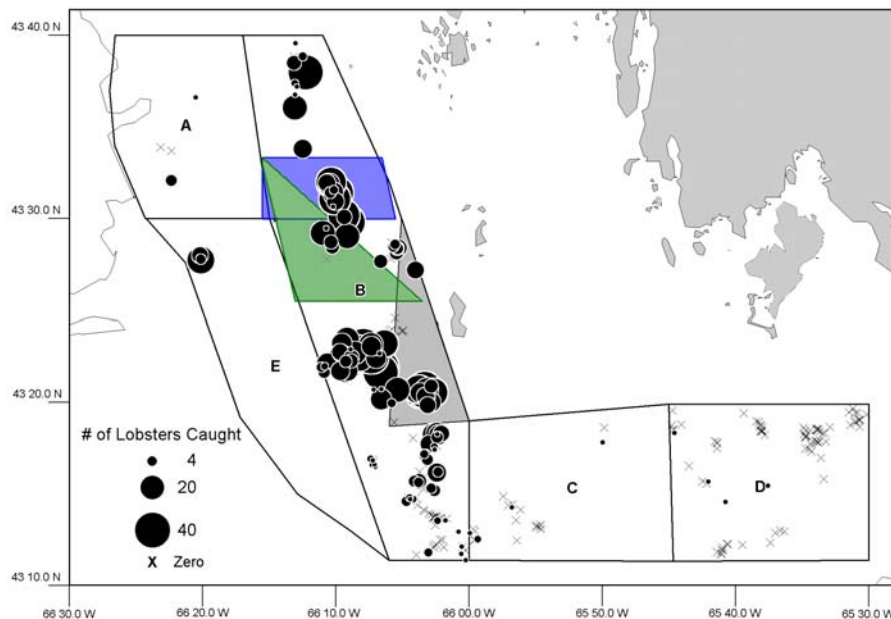


Figure 6. Location and number of lobsters caught in SFA 29 during 2008 from observed scallop fishing trips. Crosses indicate locations where no lobsters were captured. Areas closed in subarea B during the fishery due to lobster bycatch are indicated by the two upper polygons. The lower triangle (grey shading) was used in previous years (2005 and 2006) to monitor lobster bycatch through mandatory observer coverage in the area.

In addition to lobsters, observers onboard the scallop fishing vessels also record the **other invertebrates and fish species** that are caught with the scallops. A total of 113 types of animals, many only identified to the genera or family level, have been recorded in the bycatch of this fishery since 2001. The observers do not record the condition of these animals and there are no data on the survival rate of these animals once they have been returned to the water.

Rock crabs, sculpins and Jonah crabs continue to be the dominant species in the bycatch in 2008. However, it has been previously noted that estimated catch weights of bycatch species are approximate as the observers generally record the lowest weights as one kilogram. It is likely that the catch weights of smaller animals (e.g., sculpins, hermit crabs, rock and Jonah crabs) were overestimated because of this practice.

Sources of Uncertainty

A depletion analysis method has been applied to these data. The assumptions of no recruitment, natural mortality, equal vulnerability of commercial size scallops to the fishing gear and minimal growth during the period of the fishery required for the depletion method, have not been verified.

The apparent lack of population dynamics information in survey estimates needs to be addressed to validate the analysis of the commercial catch rate data.

Little is known about the recruitment or total mortality of scallops in this area.

CONCLUSIONS AND ADVICE

The time series for the annual surveys, commercial catch rates and catch are still too short for the population dynamics to be adequately modelled in a manner similar to scallop populations in the Bay of Fundy. Advice was based on the interpretation of trends in the above time series.

The very patchy distribution of scallops in subarea A has resulted in highly variable survey index and there did not appear to be much of a trend in this index in recent years. Catch rates from both fleets have increased since 2006 over a period of declining catches. A 2009 catch in the range of 10 to 20 t is recommended.

The survey index for subarea B has been stable over the last three years while catches have declined from 116 t to 65 t. Commercial catch rates for the Full Bay fleet have declined by 19% during this same time period while the East of Baccaro fleet catch rates have remained stable. The depletion model indicated that relative exploitation declined from 2007 to 2008 from 0.17 to 0.08 with the decrease in catch from 80 t to 65 t. A catch level of between 60 to 80 t is recommended for 2009.

In subarea C the Full Bay survey index has been stable since 2006 while the East of Baccaro survey index has been increasing. Similarly, the Full Bay fleet commercial catch rates have also been stable over the last three years and the East of Baccaro fleet catch rates have increased from 2007 to 2008. During this same period catches have declined from 111 t to 54 t. Relative exploitation estimates have been stable for 2007–2008. Catches for 2009 are recommended to be in the range of 60 to 80 t.

The Full Bay survey index in subarea D suggested an increase from 2007 to 2008 while the East of Baccaro survey index indicated a continuous declining trend since 2005. Both commercial catch rate series have been decreasing since 2005 with a 31 to 34% reduction since 2006. While catches have declined from 156 t in 2006, the increase from 95 t in 2007 to 125 t in 2008 was estimated to have increased relative exploitation from 0.12 to 0.25. With three out of four indices showing declines at current catch levels, it is recommended that the 2009 catch be set to no higher than last year's TAC of 85 t.

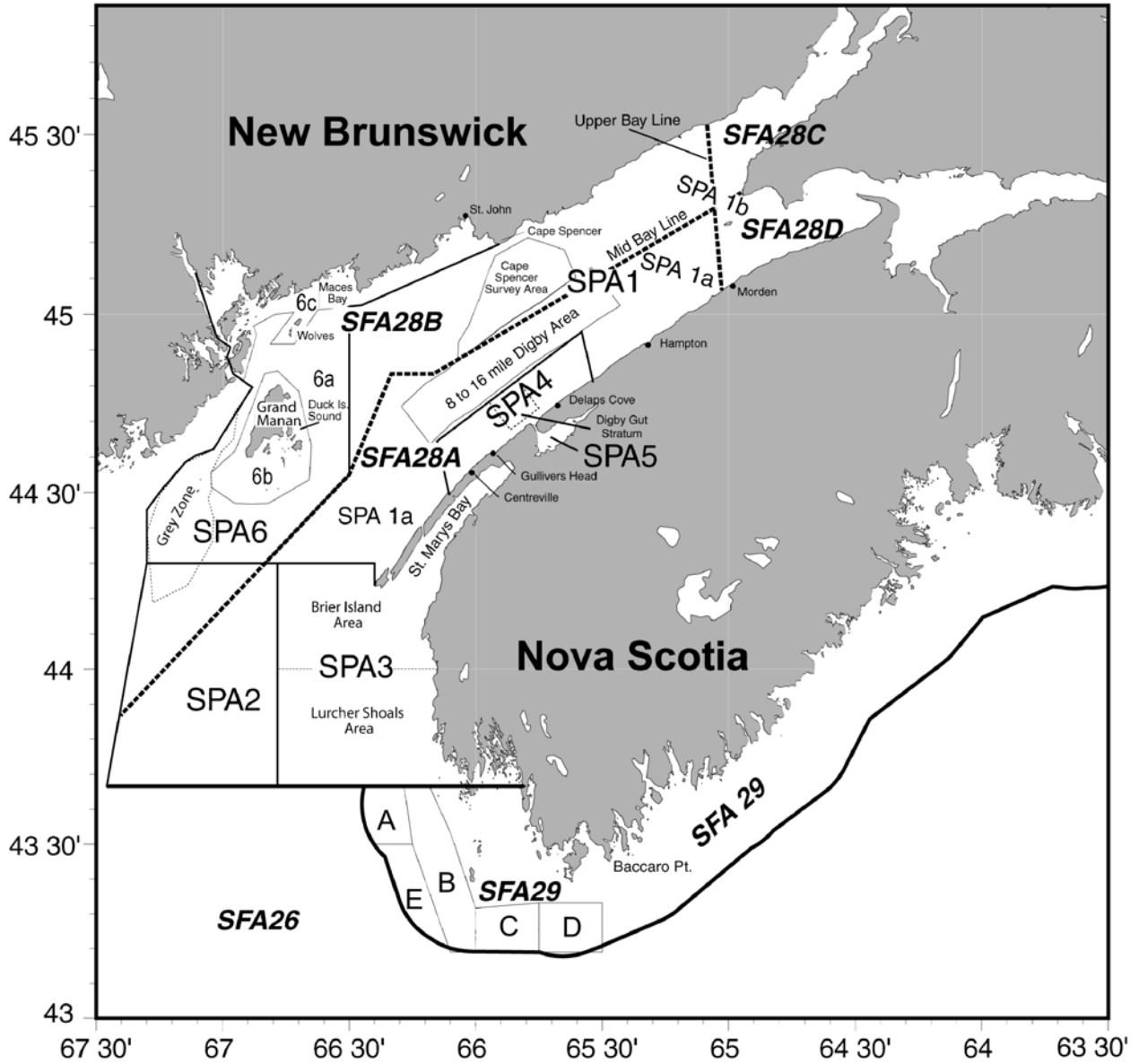
OTHER CONSIDERATIONS

During the July–October moulting period, lobsters are less mobile, more prone to injury, and involved in mating. Measures have been taken to avoid scallop fishing in areas where, or at times when, lobsters are in high concentrations or are soft-shelled. The closure of a portion of subarea B in previous years due to high lobster bycatch has been an example of the type of measure that could be employed. Setting the start date for this fishery as early as possible in June may help to avoid having the scallop fishery overlap with the lobster moulting period.

SOURCES OF INFORMATION

Smith, S.J., C. Denton, B. Hubley, I. Jonsen, M.J. Lundy, D. Pezzack, J. Sameoto, and M.J. Tremblay. 2009. Scallop Fishing Area 29: Stock Status and Update for 2009. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/038.

Appendix 1. Locations and place names for inshore scallop grounds.



FOR MORE INFORMATION

Contact: Stephen Smith
Population Ecology Division
Department of Fisheries and Oceans
Bedford Institute of Oceanography
P.O. Box 1006, Dartmouth
Nova Scotia B2Y 4A2

Tel: (902) 426-3317
Fax: (902) 426-1862
E-Mail: stephen.smith@dfo-mpo.gc.ca

This report is available from the:

Centre for Science Advice (CSA)
Maritimes Region
Fisheries and Oceans Canada
Box 1006, Stn. B203
Dartmouth, Nova Scotia
Canada B2Y 4A2

Telephone: 902-426-7070

Fax: 902-426-5435

E-Mail: XMARMRAP@mar.dfo-mpo.gc.ca

Internet address: www.dfo-mpo.gc.ca/csas

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