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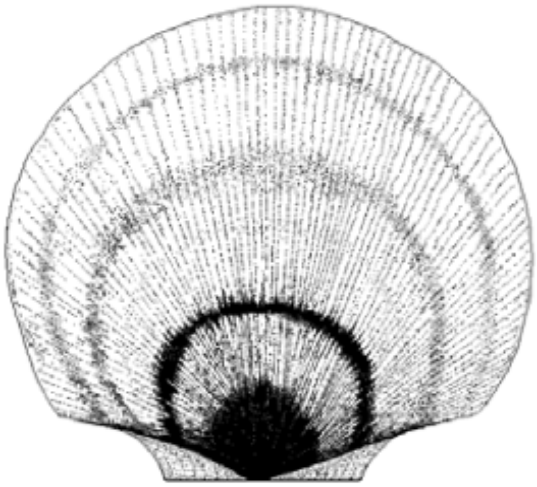
Canadian Science Advisory Secretariat
Newfoundland and Labrador Region | Science Advisory Report 2021/044

AN ASSESSMENT OF SEA SCALLOP ON THE ST. PIERRE BANK (SUBDIVISION 3PS)



*Sea Scallop (*Placopecten magellanicus*)*

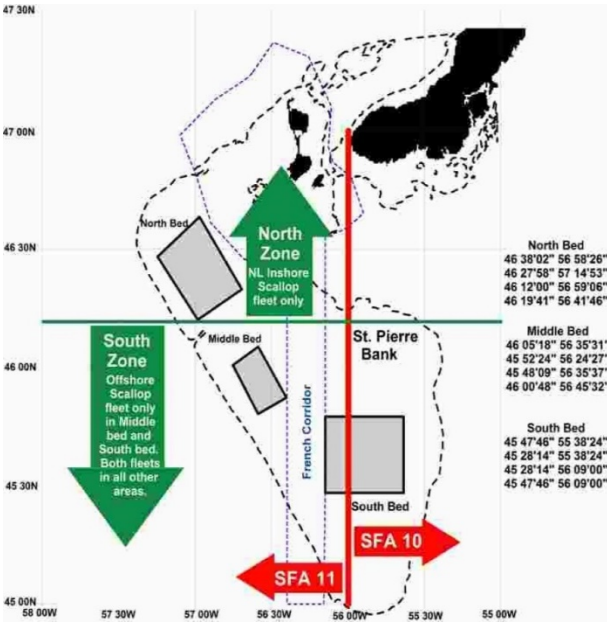


Figure 1: St. Pierre Bank showing the three main Sea Scallop beds, the Hooley recommended fleet separation zones and Scallop Fishing Areas (SFA) 10 and 11.

Context:

*The directed fishery for Sea Scallops (*Placopecten magellanicus*) started on the St. Pierre Bank in the late-1970s. Populations on St. Pierre Bank are mainly found in three beds at depths of 40-100 m (Fig. 1). They are usually found on hard bottom, with variable substrate composition, consisting largely of sand, gravel, shell fragments, and stones. The Sea and Iceland Scallop distributions overlap to varying degrees with complete overlap in the Middle bed, and a high degree of overlap in the North bed. A large area in the southern portion of the South bed, with a sandy substrate, is inhabited only by Sea Scallops.*

Prior to 2006 the fishery was managed by a Total Allowable Catch (TAC), and meat count regulations were applied to the offshore fleet, but not to the inshore fleet. In 2006, following the recommendations of the Hooley Report (Hooley 2005), specific fishing areas and TACs were applied to each fleet (Fig. 1). From 2006 to 2015 the offshore fleet did not fish on the St. Pierre Bank and started fishing again in 2016, while fishing has been consistently prosecuted in the North bed by the Newfoundland and Labrador (NL) inshore fleet since 2006.

A Canadian research vessel (RV) survey for Sea Scallops on the St. Pierre Bank (Subdiv. 3Ps) was completed in September 2019.

This Science Advisory Report is from the Regional Peer Review Process held February 25, 2020 on the Assessment of Sea Scallop on the St. Pierre Bank (Subdivision 3Ps). Additional publications from

this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- Landings since 2016 have averaged 720 t, round in the North bed, and averaged 90 t, meat weight in the Middle and South beds.
- Based on a research vessel survey in September 2019 the minimum dredgeable biomass (MDB) index is 12,725 t, round. This point estimate is associated with high variability and a subsequent high level of uncertainty.
- Based on survey data (scallops >60 mm) the meat counts in the North bed were 34 meats/500g and 17 meats/500 g in the Middle and South beds.
- The abundance in the North bed is currently dominated by a modal group of scallops 75 mm, while in the South and Middle beds the modal group is 120 mm and 130 mm respectively.
- Overall the natural mortality index for Sea Scallop has decreased from a survey time series high of 0.13 in 2015 to 0.02 in 2019, similar to levels observed from 2003 to 2006.
- The abundance of small scallop in the North bed indicate favourable prospects for the fishery in the near future.

INTRODUCTION

Species Biology

The Sea Scallop (*Placopecten magellenicus*) is confined to the Northwest Atlantic and ranges from the Northern Gulf of St. Lawrence to Cape Hatteras, North Carolina. It is normally found in waters between depths of 10-100 m. Fishable aggregations are found from the Virginia Capes to Port au Port Bay, NL, with Georges Bank, off Nova Scotia, being the world's largest producer. The Sea Scallop fishery on the St. Pierre Bank is a pulse fishery, largely dependent on sporadic settlement and subsequent recruitment. Sea Scallops are found on highly variable substrates; on St. Pierre Bank, they are generally found on fine and coarse sand, gravel, small rocks and shell fragments. The Sea Scallop is a filter-feeder, consuming plankton and detritus, and is associated with areas of strong currents. Unlike many species of scallops, this species is gonochoric, having one of two distinct sexes for its lifetime. Sea Scallops can become sexually mature as early as age 1 but their first spawning does not occur until their second year at a shell height ranging from 23-75 mm. Spawning in Newfoundland waters begins in July and may be initiated by changes in temperature, food supply, and current speed. Eggs are externally fertilized and larvae are planktonic for 35 to 45 days before settling to the bottom, possibly at considerable distances from the spawning adults, depending on currents. Sea Scallops have been known to live up to 21 years. Adults commonly reach shell heights between 100-150 mm, but have been found at sizes greater than 200 mm (DFO 2007).

The Fishery

Annual landings of Sea Scallop from the St. Pierre Bank have been highly variable (Fig. 2), as is typical of 'pulse'-type fisheries. Directed fishing started in the late-1970s and landings peaked twice in the 1980s, at 6,000 t, round in 1982 and 10,000 t in 1988. Landings declined through the early-1990s and removals were less than 500 t until 2003. Landings peaked again in 2004 and 2005 at approximately 4,500 t and 2,400 t, respectively. Prior to 2006 the fishery was

managed by a TAC, and meat count regulations applied to the offshore fleet, but not to the inshore fleet. Following the release of the Hooley report (Hooley 2005) in 2006, the Minister assigned fishing areas based on three known fishing beds on the St. Pierre Bank (Fig. 1) (DFO 2011). Between 2005 and 2010 landings from the inshore fleet (North bed) ranged from 300 t to 770 t, increased to 1,190 t in 2012, and averaged 900 t since (Fig. 2). The offshore fleet (Middle and South beds) did not fish on the St. Pierre Bank from 2006-15. Since resumption of fishing in 2016, landings have averaged 90 t meat weight (Fig. 3). Since 2006, the TAC and landings for the inshore fleet (North bed) have been recorded as round tonnes, whereas the offshore fleet (Middle and South beds) TAC and landings are recorded in meat weight tonnes.

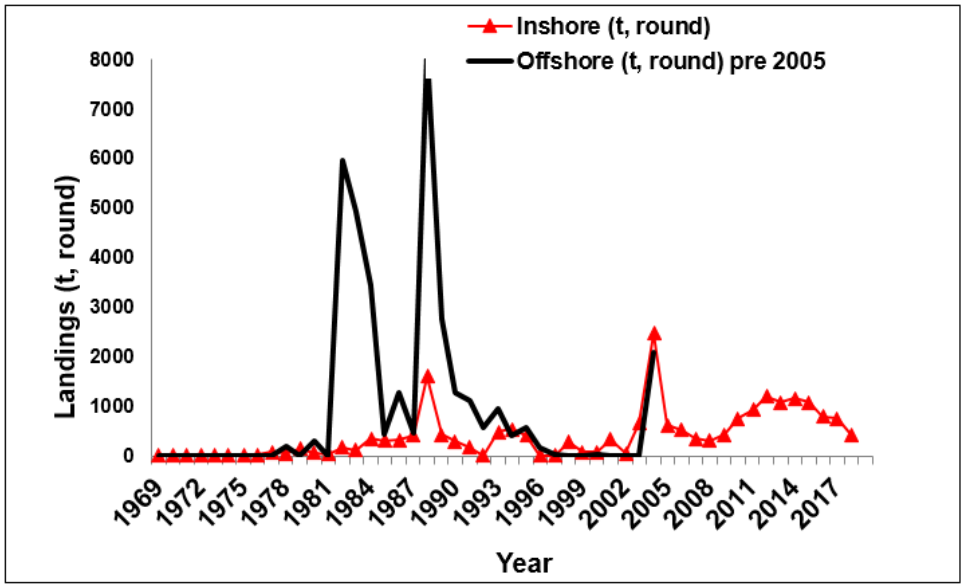


Figure 2: Sea Scallop landings (t, round) from the three main beds on the St. Pierre Bank by inshore and offshore fleets.

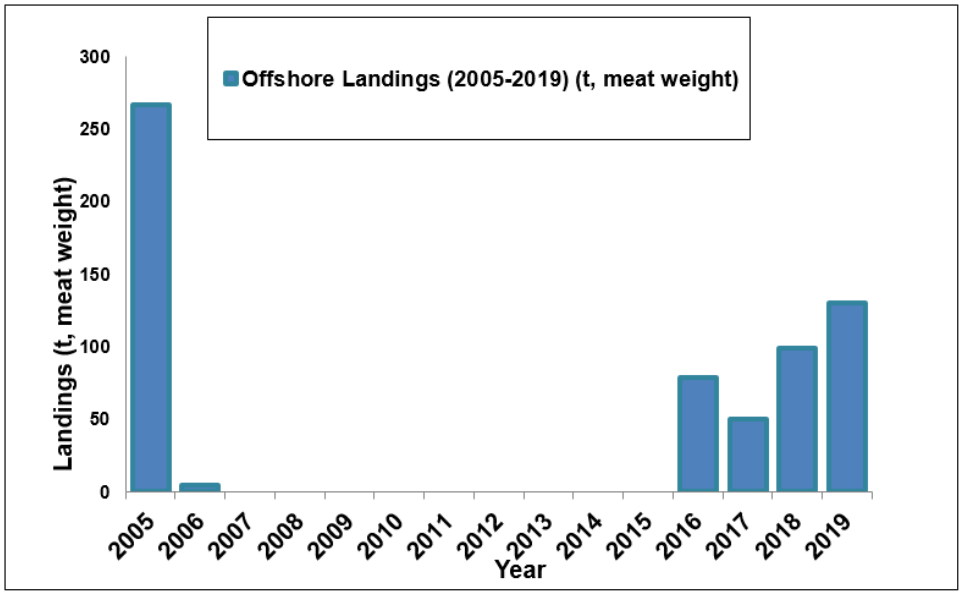


Figure 3: Sea Scallop landings (t, meat weight) from the Middle and South beds on the St. Pierre Bank from 2005 and 2019.

Since 2016, the TAC for the inshore fleet has been 872 t, round while the offshore fleet TAC has been variable with 90 t (meat weight) allocated in 2016 and 50 t, 100 t, and 125 t, (meat weight) respectively allocated in 2017, 2018 and 2019.

Catch per unit effort (CPUE) (unstandardized) based on harvester logbook data from the North bed (2003-18) peaked in 2010 and 2011 at approximately 0.2 t, round/tow and remained stable without trend from 2013 to 2018 (Fig. 4).

For the offshore fleet the CPUE (kg/hm [hour-meters: product of number of dredges × width of dredges in meters × tow duration in hours]) was highly variable in the last few years (Fig. 5).

Figure 4: CPUE (unstandardized) t, round/ tow for Sea Scallop in the North bed, 2003-18.

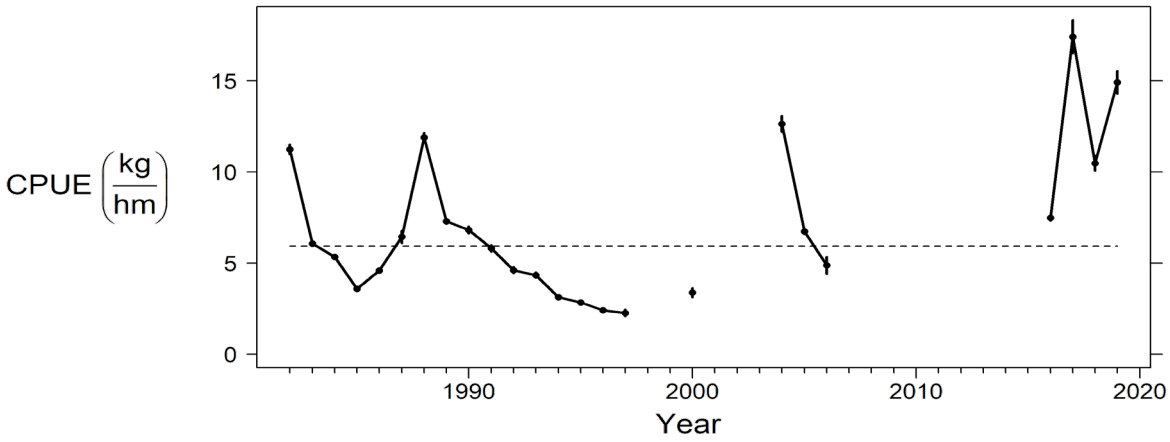


Figure 5: CPUE (kg/hm) for Sea Scallop in the offshore fleet (Middle and South beds), 1982-2019. Hm (Hour-meters: product of number of dredges × width of dredges in meters × tow duration in hours).

ASSESSMENT

Research Vessel (RV) Surveys

Resource assessment surveys were conducted by Fisheries and Oceans Canada (DFO) in 2003 using the *CCGS Wilfred Templeman* and in 2010, 2015 and 2019 using the *CCGS Alfred Needler* following a stratified random sampling scheme. Stratification was based on beds and strata (Fig. 6). Sets (in 2019) were optimally allocated in proportion to stratum-specific area and variance of the catch rates from the previous 2015 survey. Minimum dredgeable biomass (MDB) was derived by *STRAP* (Smith and Somerton 1981) from swept area estimates within survey strata. From 2004 to 2006 the offshore fleet, using the vessel *Cape Keltic,* conducted similar surveys.

An 8 ft. New Bedford scallop dredge equipped with 3 inch rings and interconnected with 2-top and 3-bottom link configuration was used in all surveys. Standard tow length for the DFO surveys was 0.5 nmi whereas the *Cape Keltic* surveys used 0.5 mi. tow length. Upon completion of each tow (set) empty scallop shells with non-disarticulated valves (“cluckers”) and live scallops were sorted by species. Total catches were enumerated and weighed by species. Biomass estimates were inflated by inclusion of epibionts in the catch weight. However, this bias did not affect trends in biomass. Shell height of scallops was determined from each set based on either the total catch or a sub-sample. In addition, during the DFO surveys, biological meat yield samples were collected from at least one set per stratum to determine the biological meat count (number of meats per 500 g) Individual shell height and meat weight information was also collected in each bed in 2010, 2015, and 2019. Sea stars were also identified to species, measured, and enumerated.

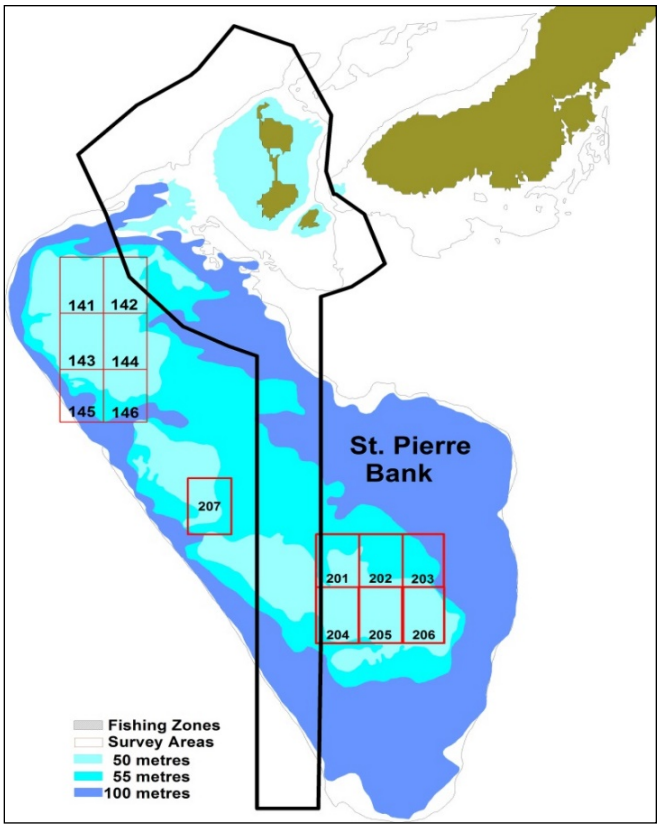


Figure 6: Stratification scheme used in the 2019 DFO survey.

Biomass

Based on the DFO RV survey in September 2019 the MDB index is estimated to be 12,725 t, round; the highest biomass since 2004. This point estimate is associated with high variability and a subsequent high level of uncertainty.

The overall biomass estimate constituted 26% of the MDB in the South bed, 72% in the North bed and only 2% in the Middle bed. The increase in overall biomass since 2015 increased by 53% and is mainly due to the increase in the North bed. The biomass decreased from 516 t to 297 t in the Middle bed and from 3,575 t to 3,265 t in the South bed (Fig. 7).

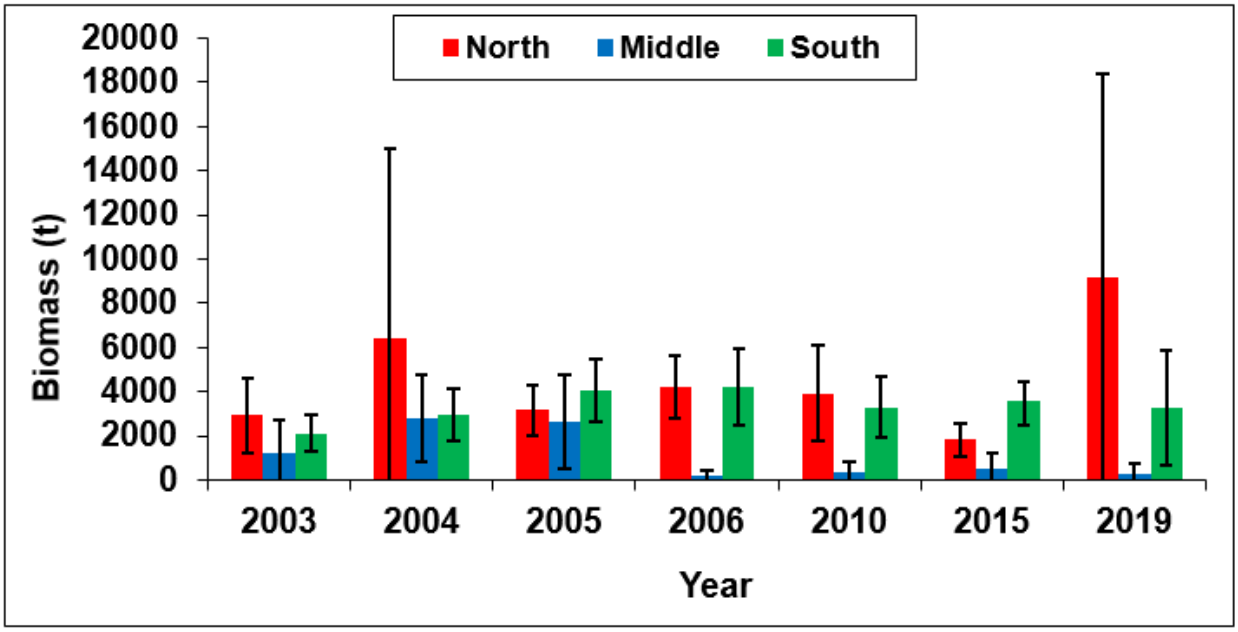


Figure 7: MDB estimates (with 95% confidence intervals) for the three main beds on the St. Pierre Bank from 2003 to 2019.

Due to an error in the randomized set allocation for the 2019 scallop survey there was a reduction in the area coverage where portions of the strata were excluded from the set allocation (Fig. 8).

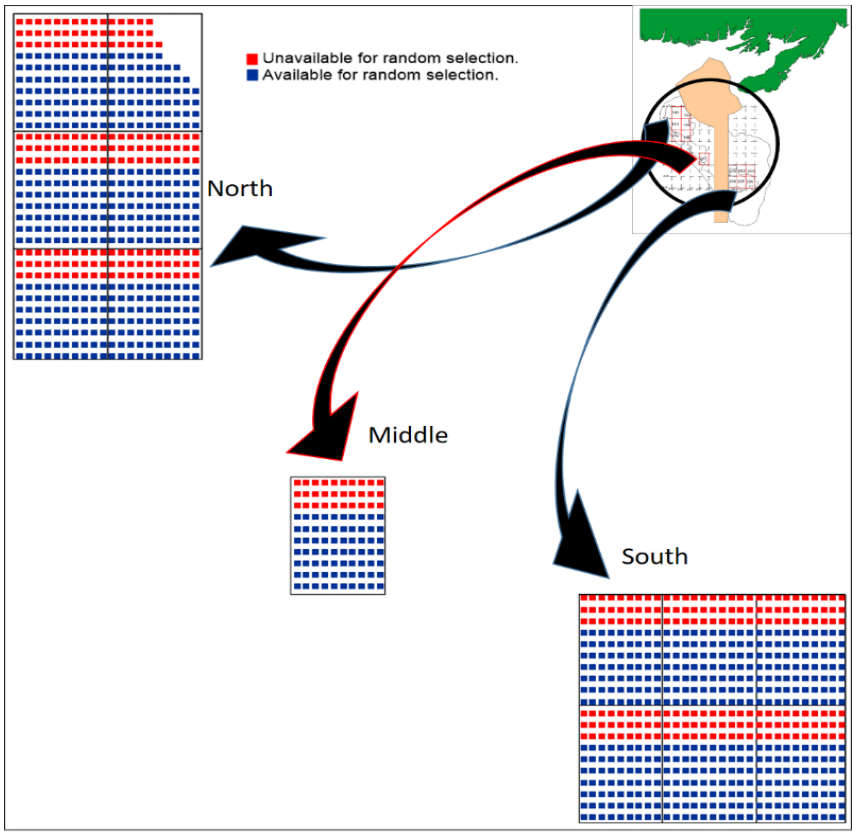


Figure 8: Map showing the strata with the blue area representing the area that was included in the set allocation in 2019, and the red area representing the area that was not used in the set allocation.

To investigate whether the reduction in the area covered within each strata had an effect on the biomass and abundance estimates for 2019, the biomass estimates from past surveys (2003-06, 2010 and 2015) were calculated with all sets included and then calculated using only those sets that fell within the 2019 survey area. The biomass estimates from both iterations were compared and showed a clear, similar trend (Fig. 9).

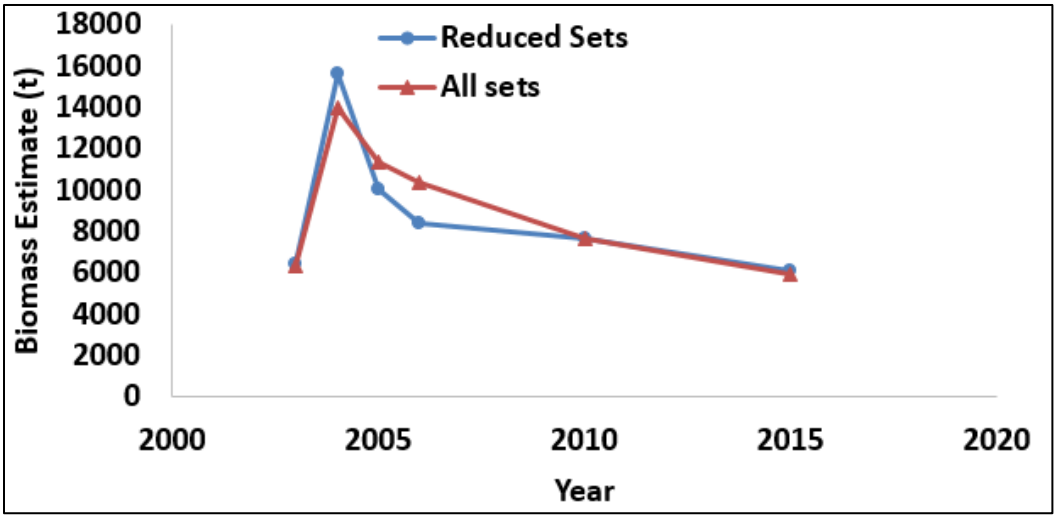


Figure 9: Sea Scallop time series (2003-15) biomass estimate comparison between full survey area coverage and the 2019 reduced area.

In 2019, the abundance in the North bed was dominated by a modal group of scallops (75 mm) while in the South and Middle beds the modal groups were 120 mm and 130 mm, respectively (Fig. 10). This high abundance of smaller scallop was also reflected in the higher biological meat counts (specifically in the North bed), which increased from 28/500g in 2015 to 34/500 g in 2019 (Fig. 11), while in the South bed the meat counts remained the same at 17/500 g in 2010, 2015 and 2019 (Fig. 11).

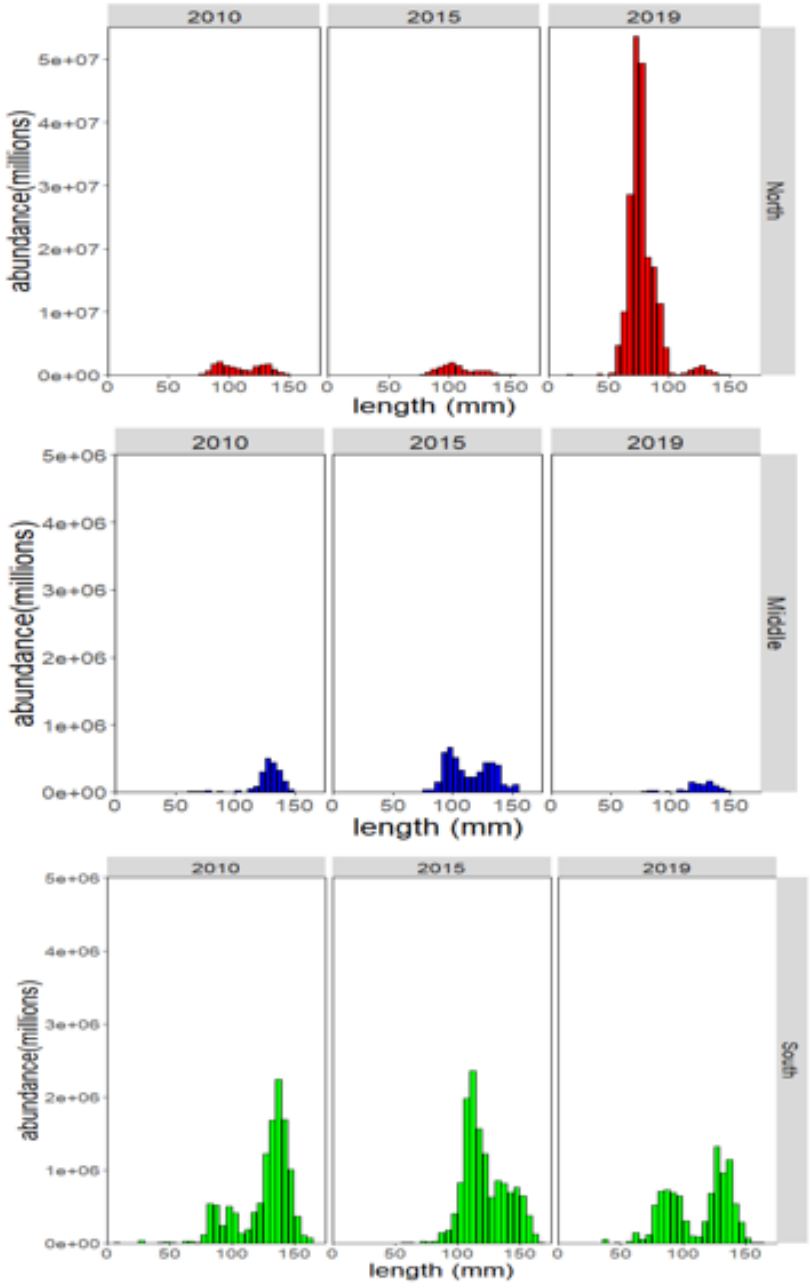


Figure 10: Size structure (length frequency [5 mm] groupings) of Sea Scallop sampled in research assessment surveys in the North, South and Middle beds on the St. Pierre Bank from 2010, 2015, and 2019.

An analysis of meat weight at shell height showed heavier meats for a given size in the South bed compared to the North bed (Fig. 12). It was also evident from this analysis a high abundance of smaller size scallop were caught in the North bed.

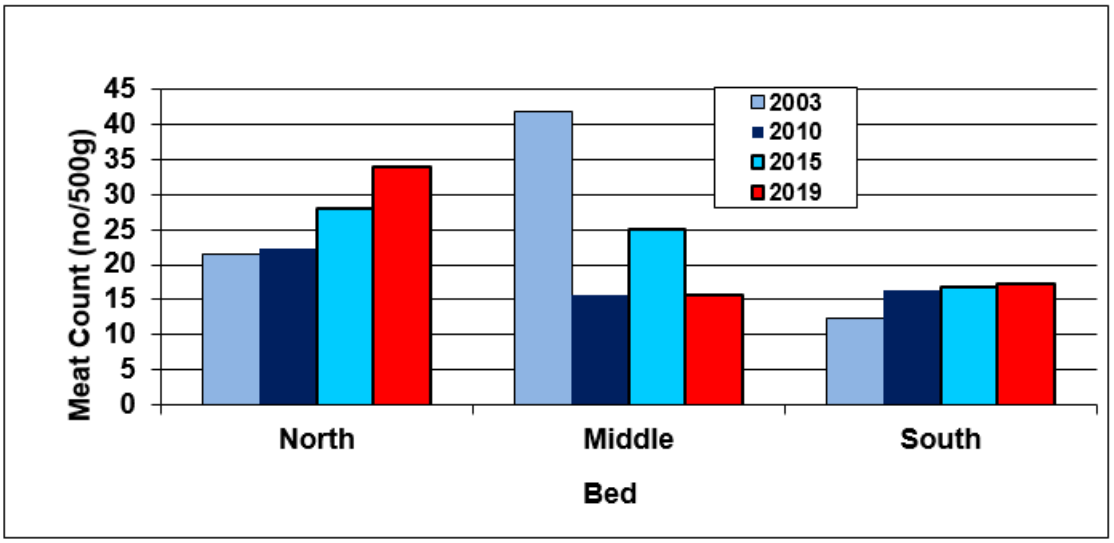


Figure 11: Biological meat count (no/500 g) for the North, Middle and South beds based on the 2003, 2010, 2015, and 2019 resource assessment surveys.

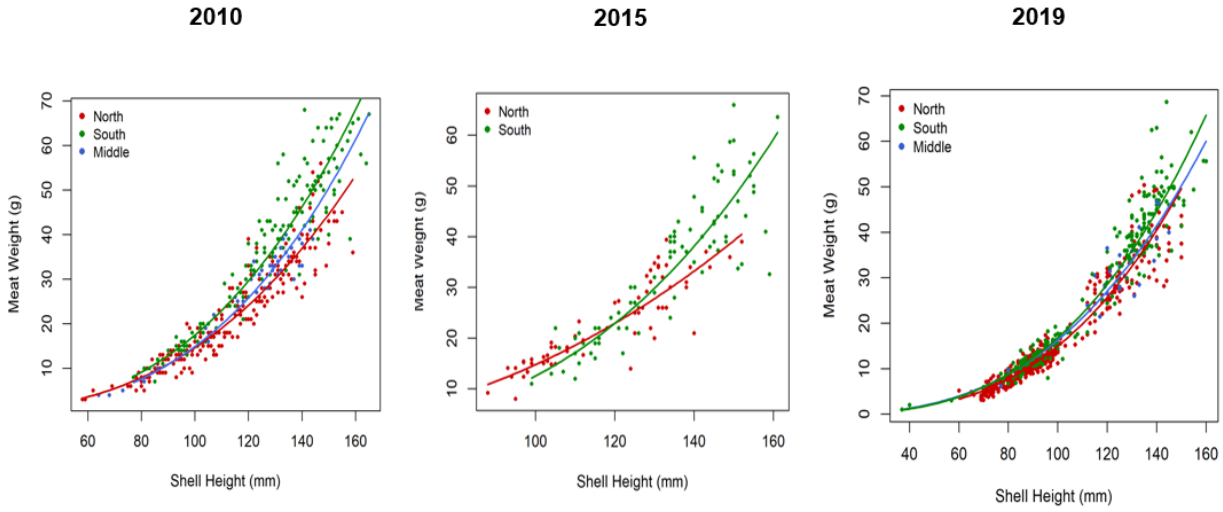


Figure 12: Shell height (mm) vs. meat weight (g) from the 2010, 2015 and 2019 surveys for the North, South and Middle beds.

Mortality

The natural mortality index (computed from the ratio of cluckers to live scallops) (Naidu 1988) decreased from 0.13 in 2015 to 0.02 in 2019. This low level is associated with low biomass of predatory sea stars.

Sources of Uncertainty

The MDB index is 12,725 t, round. This point estimate is associated with high variability and a subsequent high level of uncertainty. Due to a reduction in survey time, the number of sets in

the resource assessment survey was lower than previous surveys, and there were select high catches which increased the variability.

The CPUE is based on the harvester logbooks and is not standardized. It does not account for tow length, number of tows, tow speed, and gear type.

CONCLUSIONS AND ADVICE

The minimum dredgeable biomass index of 12,725 t, round is the highest estimated since 2004.

Catch per unit effort (unstandardized) based on harvester logbook data from the North bed has remained stable without trend between 2013 and 2018.

The abundance in the North bed was dominated by a modal group of 75 mm scallops while in the South and Middle beds the modal group was 120 mm and 130 mm, respectively. The abundance of small scallop in the North bed indicate favourable prospects for the fishery in the near future.

LIST OF MEETING PARTICIPANTS

Name	Affiliation
Alan Reeves	DFO Resource Management, Maritimes Region
Brittany Keough	Center for Science Advice, NL Region
Chris Strowbridge	Harvester
Christina Bourne	DFO Science, NL Region
Connie Dobbin Vincent	DFO Resource Management, NL Region
Craig Taylor	Torngat Wildlife, Plants and Fisheries Secretariat
Darrell Mullowney	DFO Science, NL Region
Darren Sullivan	DFO Science, NL Region
David Bélanger	DFO Science, NL Region
David Small	DFO Resource Management, NL Region
Elaine Hynick	DFO Science, NL Region
Elizabeth Coughlan	DFO Science, NL Region
Erika Parrill	Center for Science Advice, NL Region
Erin Carruthers	Fish, Food, and Allied Workers Union
Frédéric Cyr	DFO Science, NL Region
Gary Maillet	DFO Science, NL Region
Hannah Munro	DFO Science, NL Region
Jody Manning	Nunatsiavut Government
Julia Pantin	DFO Science, NL Region
Katherine Skanes	DFO Science, NL Region
Krista Baker	DFO Science, NL Region
Krista Tucker	DFO Science, NL Region
Laurie Hawkins	DFO Resource Management, NL Region
Mariano Koen-Alonso	DFO Science, NL Region
Martin Henri	DFO Resource Management, NL Region
Michael Hurley	DFO Science, NL Region
Nancy Pond	NL Department of Fisheries and Land Resources
Rob Coombs	Nunatukavut Community Council
Roger Stirling	Seafood Producers Association NS (SPANS)
Roland Hedderson	Fish, Food, and Allied Workers Union
Sana Zabihi-Seissan	DFO Science, NL

Name	Affiliation
Stephanie Boudreau	DFO Science, Gulf Region
Travis Van Leeuwen	DFO Science, NL
William Coffey	DFO Science, NL

SOURCES OF INFORMATION

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DFO. 2007. Sea Scallop Status on St. Pierre Bank (Subdivision 3Ps). DFO Can. Sci. Advis. Sec. Sci. Resp. 2007/006.

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Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
P.O. Box 5667
St. John's, NL, A1C 5X1

Telephone: 709-772-3332
E-Mail: DFONLCentreforScienceAdvice@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

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