

Scallops in Scallop Production Area 4 (Bay of Fundy)

Background

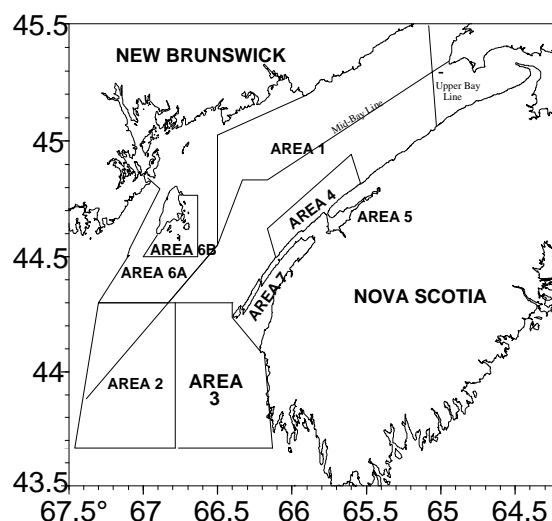
The sea scallop *Placopecten magellanicus* occurs only in the northwest Atlantic Ocean from Virginia north to Labrador. Within this area, scallops are concentrated in persistent, geographically discrete aggregates or "beds", many of which support valuable commercial fisheries. The larger beds are found offshore and in the Bay of Fundy along the Nova Scotian coast. 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.

The Digby beds have supported consistent fishing at least since the 1920s and are thought to be self sustaining. Until recently, most of the scallop harvest in the Bay of Fundy came from these beds.

99 Full Bay license holders are licensed to fish in Scallop Production Area 4. These vessels are between 45' and 65' long, and tow 7 to 9 drags off the starboard side.

This industry became a quota fishery in 1997, with limited entry, TAC, gear size, seasonal closures, minimum shell height and meat count restrictions.



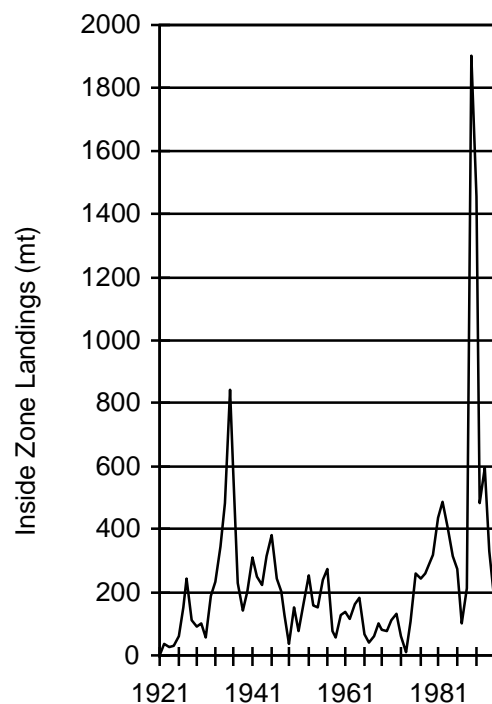
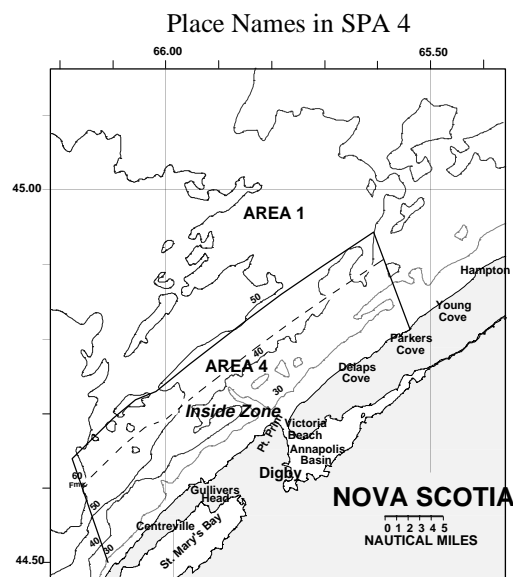
Summary

- Landings in 1997 were 116 mt (meat weight) and exceeded the quota of 100 mt.
- Survey estimates of the 1998 harvestable biomass of scallops with shell height >100 mm (mainly 1992 year-class) was the largest since 1993.
- Over 40 percent of this biomass is found between Centreville and Gullivers Head, a deep water area with slow growth and low yield.
- The 1993 year-class (80–99 mm shell height) is also abundant and mainly located between Centreville and Gullivers Head.
- 1998 survey abundance indices indicate that there was little sign of recruitment in the <80 mm shell height class.
- Current total allowable catch (TAC) set for 1998 of 120 mt (meat weight) would correspond to a 20 percent exploitation rate.

The Fishery

The Digby scallop beds were fished according to seasonal zones prior to 1996. The Inside Fishing Zone encompassed an area within 6 miles of shore, from Parker's Cove to Centreville, and was closed by regulation from May 1 to September 30. The rest of the beds were seasonally unrestricted and are referred to as the Outside Zone. In 1987, the Inside Fishing Zone was extended to 8 nautical miles from shore (to protect small scallops), to the equivalent of the present Scallop Production Area (SPA) 4. In 1992, the Inside Fishing Zone returned to the 6 mile distance from shore. In 1995, the Inside Fishing Zone was closed for the whole year to protect broodstock and the pre-recruit scallops. That part of SPA 4 which was the former Inside Fishing Zone was not fished in 1996 except for a limited fishery in a portion of the area from Digby Gut to Parkers Cove which was fished under a dockside monitoring condition from 15 November to 15 December 1996. The meat count for this area was 40/500 g. Fishing also occurred from 6 to 8 miles from shore until the establishment of the 8 mile SPA 4 on 1 January 1997. The quota for SPA 4 was 100 mt (meat weight) in 1997 with a meat count of 33/500 g.

Scallop landings off Digby, N.S. have been variable over the last decade. A strong recruitment pulse, first observed in 1986 and 1987 as 2 year old animals, contributed to unprecedented high landings in 1988 through to 1991. Although scallop abundance increased in many parts of the Bay due to these year-classes, the greatest concentration of scallops was found in the Inside Fishing Zone. From 1993 to 1996, the beds have been fished down and closures were necessary.



Historical **landings** for the former Inside Fishing Zone (0 to 6 mile portion of SPA 4) are available from 1921 to 1995.

Landings from SPA 4 are only available from 1991 to 1997.

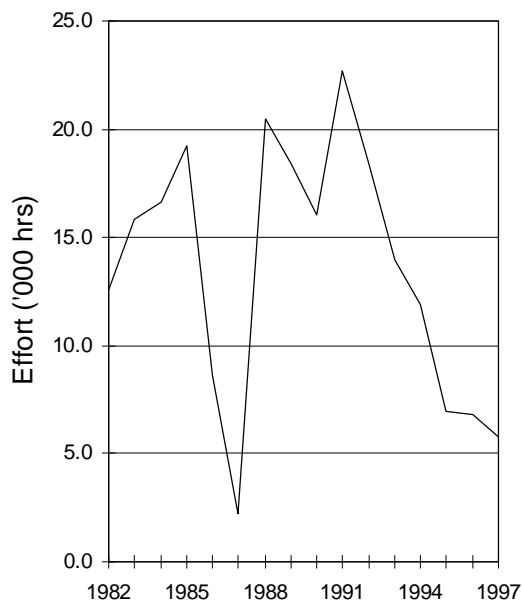
Landings mt (meat weight)

	Avg.				
Year	1991–93	1994	1995	1996	1997
Total	414	163	95	71*	116

* including landings from 6–8 miles of 9.1 mt

Landings in SPA 4 declined steadily from 1991 to 1995 as the large year-classes (1984, 1985) were fished down. Portions of SPA 4 were closed in 1995 and 1996. The 1997 fishery in the SPA 4 portion of the Bay of Fundy landed 116.1 mt (meat weight) based on recorded landings.

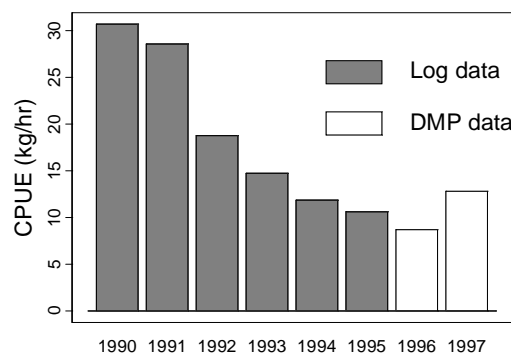
Total **effort** (hrs) in the Inside Fishing Zone was low in 1995 and 1996 due to the closure of the fishery for portions of each year.



Fleet activity, which had been monitored solely through logbooks was recorded for the first time in 1996 through a dockside monitoring program (DMP) which continued in 1997. There were also logbook and port sampling information. Of the 99 Full Bay vessels entitled to fish in this area, 75 were active in 1997.

Resource Status

The 1997 commercial **catch per unit effort** (CPUE) was 12.81 kg/hour with a minimum of 6.10 kg/hour and a maximum of 24.90 kg/hour. This was an increase in the CPUE over 1996 despite the lower meat count in 1997. The 1997 CPUE was calculated based upon 65.5 mt (meat weight) of catch. CPUE for 1990 to 1995 was obtained from log data for the old Inside Fishing Zone, whereas the data from 1996 and 1997 was from DMP. Due to the differences in sources and area covered, CPUE from 1995 and previous years cannot be compared with the 1996 and 1997 CPUE.

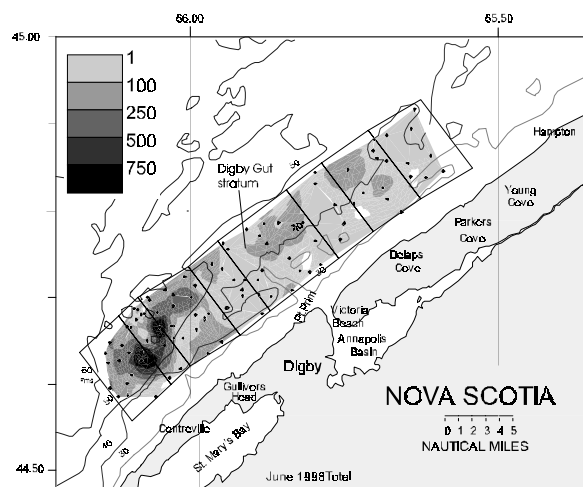


Data from **research vessel surveys** were used to assess scallop stocks. Comparable area stratified random surveys have been conducted in June since 1991. Previous to this date, surveys were stratified by commercial catch.

In 1998, 100 stratified-random tows were made in SPA 4 using the government research vessel, *J. L. Hart*.

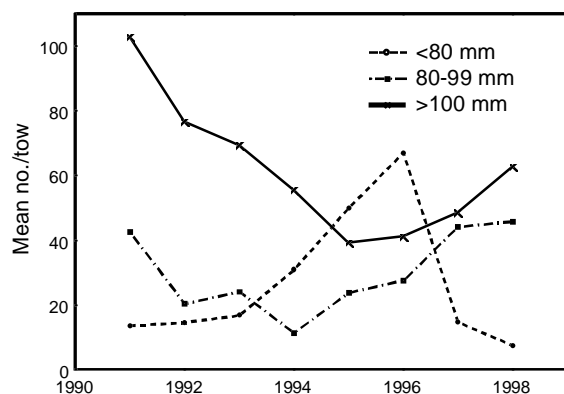
The greatest concentration of scallops in SPA 4 is in the area off Centreville and Gullivers Head. The scallops in this area are mainly from the 1992 and 1993 year-classes with the former year-class exceeding 100

mm in shell height as of June 1998. Smaller concentrations of the 1992 year-class extend into the deeper water portion of the Digby Gut stratum in the fished area.



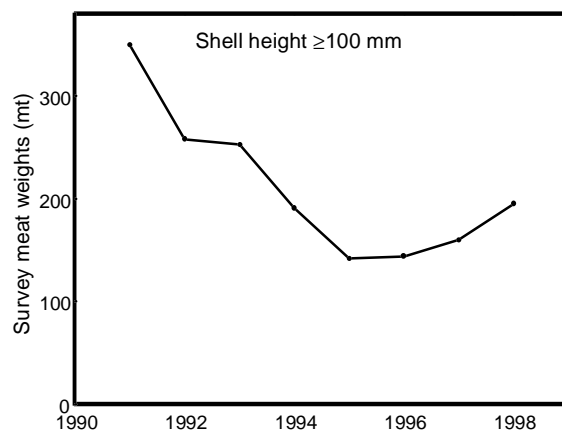
Survey abundance estimates indicate that the numbers of animals in the ≥ 100 mm shell height class have been steadily increasing since 1996 mainly due to the 1992 year-class. Scallops in the 80–99 mm shell height class have also increased since 1994 and increased slightly in 1998 mainly due to the 1993 year-class. The index for scallops with shell heights < 80 mm indicates that there is little sign of strong recruitment from any of the later year-classes.

Survey Index, Population numbers for SPA 4.



The percentage of **clappers** (dead paired shells) in 1998 was low at 6.2%, a slight increase from 1997 but lower than levels observed from 1988 to 1993. In 1998, 64% of the clappers were larger scallops over 100 mm shell height and located primarily in the Centreville to Gullivers Head strata. The numbers of clappers may reflect both natural mortality and incidental fishing mortality.

Survey meat weight estimates were calculated from the June survey data. These estimates are considered indices, not absolute estimates of the population meat weight. The 1998 estimate of 195 mt for scallops with shell heights ≥ 100 mm is the highest estimate in the 1991–1998 series since 1994.



Total mortality rates were calculated from the surveys for scallops 5+ (≥ 100) in the whole of SPA 4. Previously, exploitation/mortality rates had been estimated for the whole survey area, however, fishing has not always been allowed over the whole area. This year, mortality estimates were calculated for areas previously identified according to commercial catch levels; **Core** area (Gullivers Head, Gullivers Head to Digby, Digby, Digby to Delaps Cove and Delaps Cove strata), **Below** the Core area (Centreville, Centreville to Gullivers Head Strata) and **Above** the Core area (Parkers Cove).

SPA 4 Total mortality rates (%) for ages 5+

Years	Below	Core	Above
1991–1992	*	38	*
1992–1993	23	30	*
1993–1994	33	43	*
1994–1995	32	32	38
1995–1996	21	22	22
1996–1997	4	13	18
1997–1998	*	18	47

* unable to estimate

The lower rates in 1995 and 1996 reflect the closure of a large portion of SPA 4 in these years. While the Core area appears to have experienced a low mortality rate overall in 1996–97, the exploitation rate in the fished part of this area was close to 43%. In 1997, higher exploitation rates (29%) were observed within the Gullivers Head and Gullivers Head to Digby Gut strata of the Core area.

Outlook

The fishery will be relying mainly on the 1992 and 1993 year-classes for at least the next two years. Currently, there are no signs of significant recruitment after these year-classes have recruited to the fishery.

The 1998 TAC has been set to 120 mt (meat weight). Assuming that the survey estimate of 195 mt (meat weight) represents approximately 29 to 33 percent of the actual population meat weight (due to gear efficiency), this implies a population meat weight of 585 to 680 mt for scallops with shell height ≥ 100 mm. Therefore, the TAC of 120 mt would correspond to an exploitation rate of approximately 18 to 21 percent.

Management Considerations

The 1998 survey estimate of the total weight of meats for scallops with shell heights ≥ 100 mm is the highest since 1993, mainly due to the recruitment of the 1992 year-class. However, 41 percent of this total weight is located in the Centreville to Gullivers Head strata where the 1993 year-class is also located. Restricting the catch to shell heights greater than 100 mm in these areas should protect the 1993 year-class. An industry-based port sampling program may provide the data for monitoring year-class removal and thus the basis for regulating these removals.

For more Information

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