

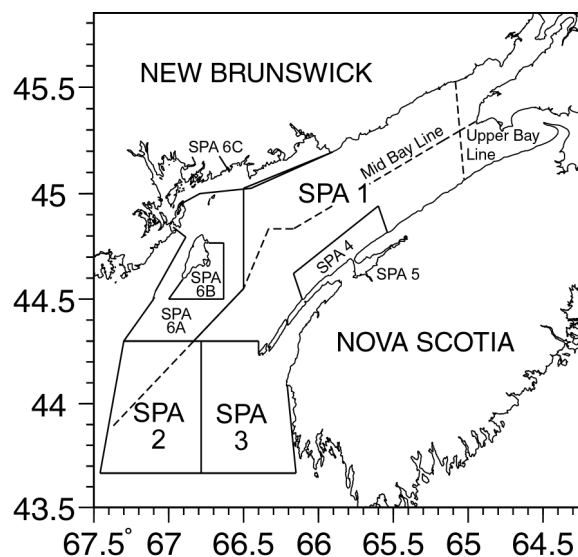
Scallops in Production Area 4 (SPA) in the Bay of Fundy

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. 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 Bay of Fundy area is fished by the Full Bay and the Mid-Bay licensed fleets. Full Bay vessels are 45' to 65' and Mid-Bay vessels are generally between 30' to 45'. Full Bay licensed vessels are permitted to fish all the Bay of Fundy. The Mid-Bay license holders have access to the New Brunswick side and portions of the Nova Scotia side of the Bay of Fundy to the Mid-bay line and a portion of SPA 2. There are also 16 Upper Bay Licences restricted to the upper reaches of the bay. The fishery has been managed using limited entry, gear size limits, seasonal closures, minimum shell height, meat count and individual meat weight restrictions. The gear width limit is 5.5 m with ring size of not less than 82 mm inside diameter. This industry became a quota fishery in 1997. Total allowable catches (TACs) are set and landings are reported in terms of meat weights (adductor muscles).



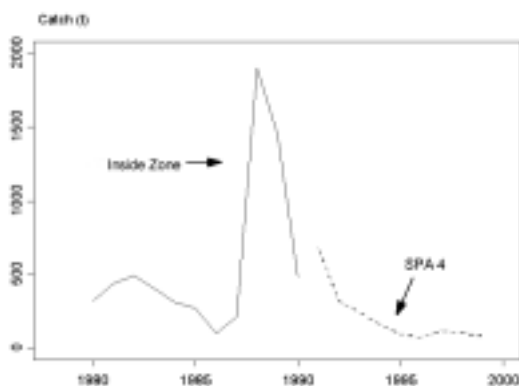
Summary

- Landings in 1999 were 79 t against a TAC of 120 t. Industry had reported that fishing was restricted by poor weather and the fishery was extended by one month into January 2000. However, there were few days in January when the weather was good enough for fishing.
- The 2000 survey indicates that the abundance of commercial size scallops (shell height ≥ 95 mm) has declined from 1999.
- There were signs in the 2000 survey of better than average recruitment of the 1997 year-class (shell height of 70 to 94 mm) in water less than 90 m depth, to the 2001 fishery.
- The 2000 survey also observed large numbers of 1998 year-class (shell height of 25–50 mm) in both SPA 4 and adjacent SPA 1. While this year-class would not recruit to the fishery until 2002/2003, the location of the year-class could expose it to increased incidental mortality due to fishing activity.

- Fishing mortality of commercial size scallops in 1999 had decreased from 1998 to about the 1991–99 average.
- Estimates from a population model indicate that a TAC of 120 t in 2000 would result in a fishing mortality of 0.19 on the population of commercial size scallops. A continuation of effort at the recent level of 9000 hours per year would result in an expected removal of not more than 90 t ($F=0.14$).
- Continuation of a full-fledged fishery in SPA 4 in the near-term runs the risk of increasing incidental mortality on the 1998 year-class, thus reducing its potential contribution to the future fishery in this area.

The Fishery

Landings in what is now SPA 4 are available from 1991 to 1999. Prior to 1991, the landings can only be apportioned to an inside zone, which represents 75 percent of the area of SPA 4. This inside zone was closed to fishing by regulation from 1 May to 30 September. The remainder of the Digby beds outside of this zone had no seasonal restrictions. The fishing season in SPA 4 has been restricted to the fall since it was established in 1997.



Landings steadily declined from 1991 to 1995 as the large year-classes (1984, 1985)

were fished down. Portions of what is now SPA 4 were closed in 1995 and 1996. The fishing industry reported that bad weather had reduced opportunity to fish in 1999. While an extension of the 1999 fishing season into January 2000 was granted, poor weather remained a problem.

Landings (tonnes of meats)

Year	Average 1991–95	1996	1997	1998	1999
TAC	–	–	100	120	120
Total	299.8	71.2	116.1	103	78.9

Total **effort** (hours) was low in 1995 and 1996 due to the closures in the inside fishing zone, but effort in SPA 4 increased thereafter until 1999. The decrease in 1999 probably reflects restricted fishing activity due to poor weather, as reported by the industry.

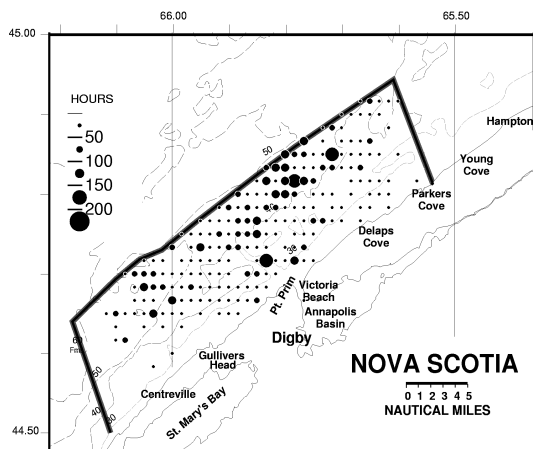


In 1998, the fishery was mainly concentrated in the deeper waters off Gulliver's Head and Centreville where previous research surveys had shown to be areas of high density but low meat yield. In 1999, the fishery generally concentrated in the more traditional areas off Digby Gut and Delaps Cove where meat yields are generally higher.

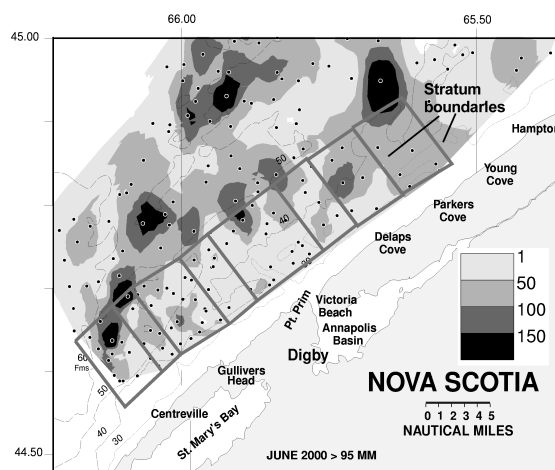
Maritimes Region

Scallop Production Area 4 in the Bay of Fundy

Effort (hours) in 1999



Mean number per tow (shell height ≥ 95 mm)



Resource Status

The average **commercial catch rate** continued to decline from 1998 to 8.8 kg/h in 1999, the second lowest since 1980.

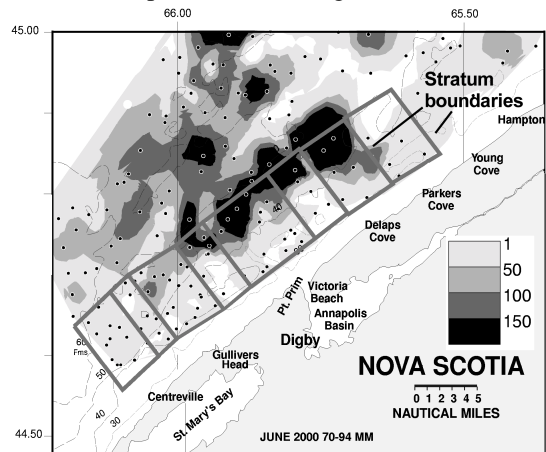


Research vessel surveys, using the same stratified random design, have been conducted since 1991. Prior to 1991, surveys had been stratified according to the current year commercial catch.

In 2000, densities of commercial size scallops (shell heights ≥ 95 mm) were reduced in the deeper water areas compared to 1999.

Recruits (shell heights 70 to 94 mm) for 2001 were widespread in areas 6 to 8 miles from the Nova Scotia shore.

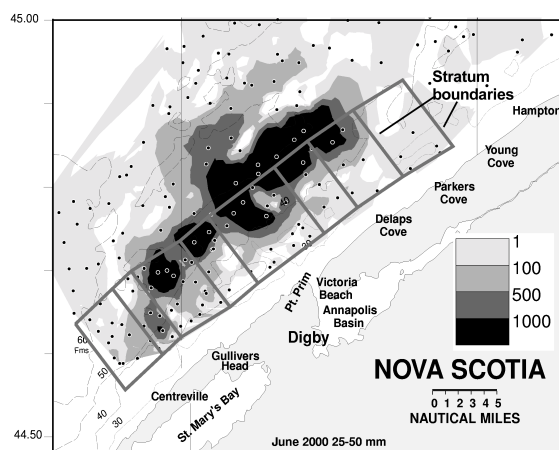
Mean number per tow (shell height 70 to 94 mm)



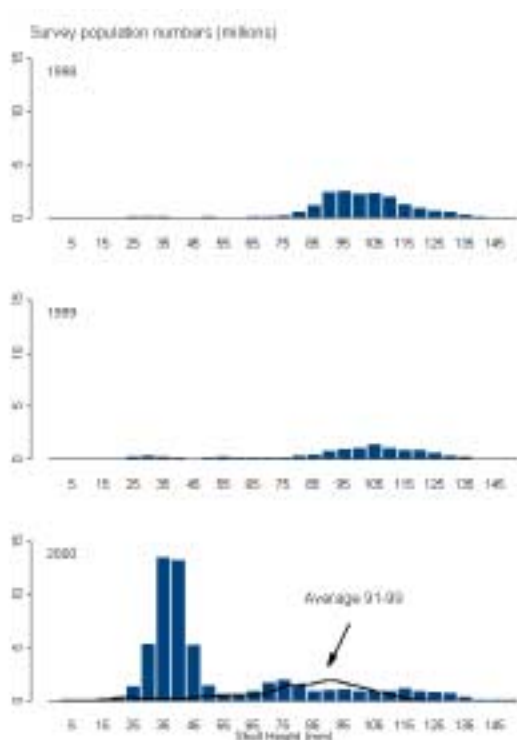
The major signal observed in the 2000 survey was the large numbers of pre-recruits (shell height < 70 mm) which appeared to be mainly concentrated in the four to eight mile zone of SPA 4 and extend into SPA 1. In SPA 4, this recruitment was mainly found in depths less than 90 m where scallops characteristically exhibit good growth and yield. Scallops with shell heights between 25 and 50 mm comprised the bulk of this recruitment. Scallops of this size range are probably two-year olds.

Maritimes Region

Mean number per tow (shell height 25 to 50 mm)



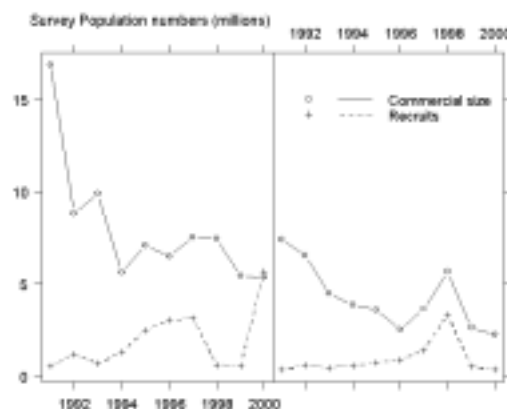
Survey estimates of the population numbers for this size range are the largest seen since this survey series started in 1991. These scallops would be expected to recruit to the fishery starting in 2002–2003.



Population estimates of commercial size scallops changed little in shallow water areas but declined in the deeper water (>90 m). While there is no evidence of

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recruitment for 2001 in the deep-water areas, there appears to be a very strong pulse in the shallow water of animals with shell heights 70 to 80 mm. These scallops were not detected in substantial numbers in the 1999 survey.



A population model was used to analyze the survey and commercial catch data to estimate fishing mortality and to evaluate potential TAC's for the 2000 fishery. There was less than 20 percent error around the estimates of population numbers from this model. Fishing mortality of commercial size scallops in 1999 had decreased from 1998 to about the 1991–99 average.



Sources of Uncertainty

The population model used here assumed a constant natural mortality over all years and

sizes. However, increasing numbers of clappers (dead paired shells) in the survey suggests that natural mortality may have increased in the deep water in the last two years.

The short length of the time-series limits the precision of the estimates from the model. Precision should improve in the future.

The population model relies on average meat weights from commercial samples to estimate numbers landed and population biomass. Prior to 2000, these samples had been obtained from a small number of vessels and did not represent all areas fished. The impact of this is that numbers landed have probably been underestimated and biomass has probably been overestimated especially in 1998.

The underlying reasons for the rare large recruitment and mortality events are unknown at present.

Outlook

There were signs in the 2000 survey of better than average recruitment of the 1997 year-class (shell height of 70 to 94 mm) in water less than 90 m depth to the 2001 fishery. The 2000 survey also observed large numbers of 1998 year-class (shell height of 25–50 mm) in both SPA 4 and adjacent SPA 1.

Estimates from the population model indicate that a TAC of 120 t in 2000 would result in a fishing mortality of 0.19 on the commercial size population. A continuation of effort at the recent level of 9000 hours per year would result in an expected removal of not more than 90 t ($F=0.14$).

Management Considerations

The two-year old scallops were found by the survey in areas that traditionally receive heavy fishing activity. Continuation of a full-fledged fishery in SPA 4 in the near-term runs the risk of increasing incidental mortality on the 1998 year-class, thus reducing its potential contribution to the future fishery in this area.

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References

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