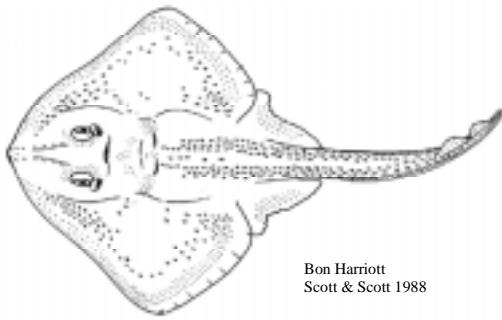


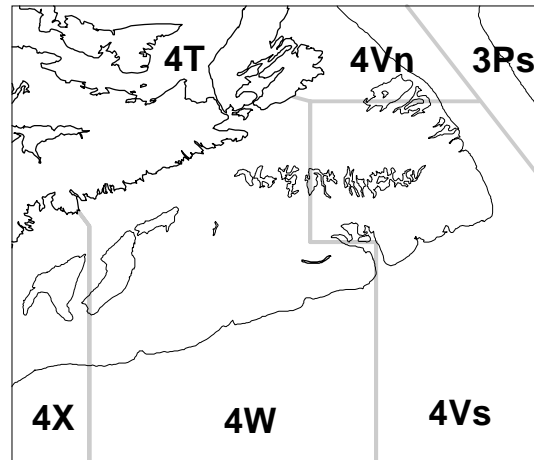


Maritimes Region



Bon Harriott
Scott & Scott 1988

4VsW Winter Skate



Background

Most elasmobranch fisheries have followed a general pattern of high initial exploitation followed by a rapid collapse. The intention has been that the 'developing' skate fishery on the eastern Scotian Shelf not follow this course. Our knowledge of skate on the Scotian Shelf is limited, however recent research is increasing our information base.

Winter skate occur in the southern waters of Georges Bank, inner Bay of Fundy and are near their northern limit of distribution on the offshore banks of the eastern Scotian Shelf. This latter area is unique because it is the only region where thorny skate overlap with winter skate, the former being more abundant in northern waters. Winter skate are the primary focus of the commercial fishery and constitute greater than 90% of the catch. Thorny skate occur as a by-catch in this fishery and only the largest individuals are retained.

Like other elasmobranchs, skates are slow growing, produce very few young each year and thus are slow to increase in population numbers. Length at 50% maturity for female winter skate occurs around 75cm. Preliminary ageing of winter skate suggests that the length at 50% maturity coincides with individuals which are 7-8 years old. Historical information shows that skates consume considerable quantities of sand lance. Skate predators have yet to be identified.

Summary

- Landings in the directed fishery have ranged from 2152t in 1994 to less than 1000t in 1998, while bycatch estimates have declined from greater than 2100t in 1990 to less than 100t in 1997.
- Commercial catch rates have remained steady since 1994.
- Removals from the fishery peak between 70 to 75cm. There has been a progressive reduction in winter skate greater than 90cm since 1995. Female winter skate mature at 75cm.
- Overall survey abundance in Div. 4VsW are at very low levels, while the slope strata indices in Div. 4VsW have increased.
- Total mortalities have doubled since 1995.
- Current harvest levels in the 'developing' fishery are not sustainable.

The Fishery

Landings (tonnes)

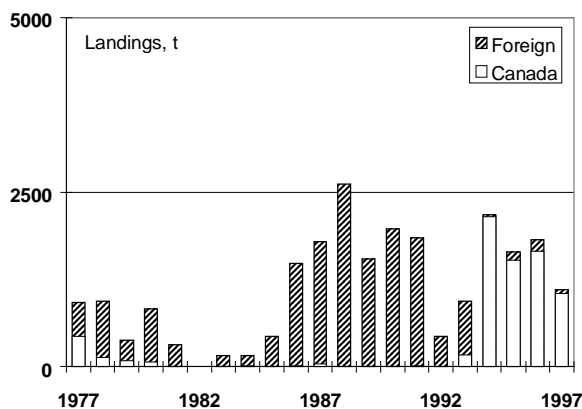
Year	1992	1993	1994	1995	1996	1997	1998
TAC ¹	-	-	2000	1600	1600	1200	1200
Foreign	262	465	12	70	103	32	
Canada ²	2	167	2152	1523	1655	1048	
Est. Disc. ³	658	289	136	126	81	68	
TOTAL	922	921	2300	1719	1839	1148	

¹ For 'developing' fishery only

² Reported landings by Canadian vessels.

³ Estimated discards based on by-catch from Canadian groundfish directed fisheries.

A regulated fishery for skates on the Scotian Shelf has existed since 1994 however **landings** data exist since 1961. Canadian landings on the Scotian Shelf have generally been low, but are not reflective of total removals due to discarding. Prior to 1977, reported foreign landings were unusually high and are not considered reliable. After 1977, reported skate landings never exceeded 2,600t and were generally restricted to Division 4W.



In 1994, a combination of closures of traditional groundfish fisheries on the Scotian Shelf and openings in the markets for skate wings resulted in the development of a directed Canadian skate fishery. Based on the 1985-94 average summer research vessel survey minimum trawlable biomass for all skate species in 4VsW (12,000t), a preliminary TAC of 1,200t was established with an additional 800t allocated to conduct joint industry/science surveys. The fishery

landed 2,152t by the end of 1994. The 1995 and 1996 directed fishery were regulated by a 1,600t TAC with an additional 20% by-catch allowed in other 4VW fisheries. In 1997, the FRCC reduced the TAC to 1,200t which continued in 1998. The depressed market for skate wings resulted in a shortfall in the TAC (1048t) by the directed fishery in 1997 and indications are that the 1998 TAC will not be reached.

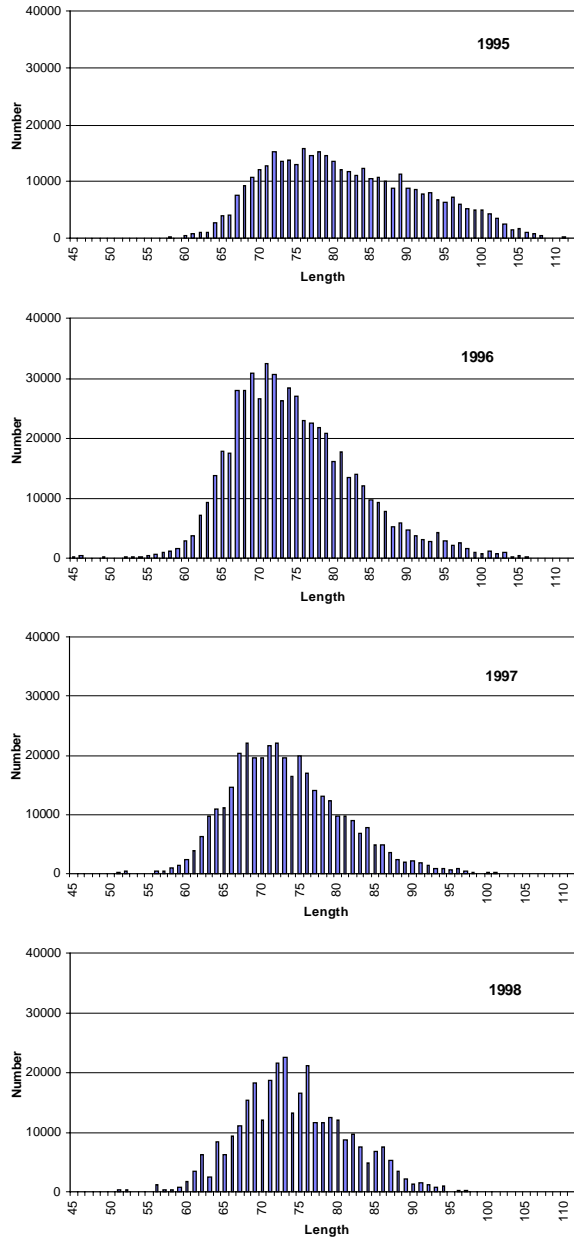
In response to conservation concerns of catching undersized skates, mesh sizes in the directed fishery have progressively increased from 255mm in 1994 to greater than 300mm in subsequent years.

Observation of the directed fishery in 1996 revealed that greater than 90% of the catch was made up of winter skate and the remainder were thorny skate. The directed skate fishery is relatively clean with observed by-catch levels of other groundfish amounting to less than 0.2%. This situation is due to the use of large-mesh gear and the current depressed levels of traditional groundfish on the eastern Scotian Shelf. There are no restrictions on discarding skates in any fishery. In 1998, industry has indicated that larger fish are found in deeper water, but there is no quantitative evidence at this time.

An examination of **commercial catch rates** of winter skate revealed no significant changes over the history of the directed fishery, either in 4Vs or 4W. Catch rates were highest in early spring, falling to estimates less than 1 t/hr in May and not increasing again until early winter.

Commercial sampling of winter skates began in 1995. Catches in 1995 peaked at 76cm and included many fish up to and in excess of 100cm. The smallest sizes landed were near 60cm. The absence of skate below 60cm is probably the result of discarding and the use of large mesh (255-320mm) cod ends. In 1996,

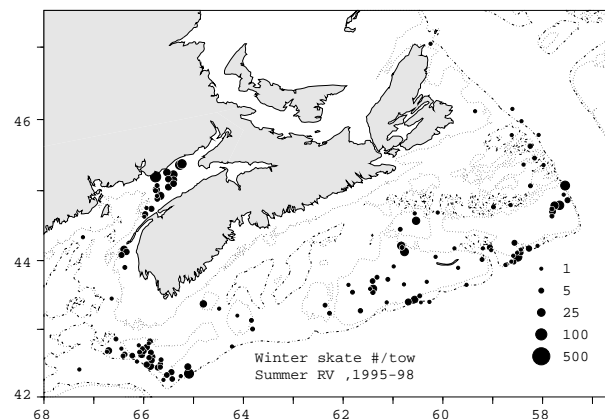
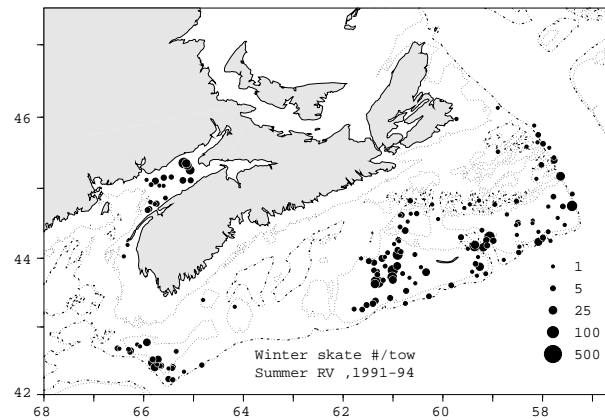
the peak had shifted to 71cm with a decline in larger fish, especially a reduction in the number of fish greater than 90cm. In 1997 and 1998, the peak remained steady at 72cm and there was a further reduction in the number of fish greater than 90cm. The percentage of fish greater than 90cm has declined from 25% in 1995 to 6% in 1996 and less than 3% in 1997 and 1998.



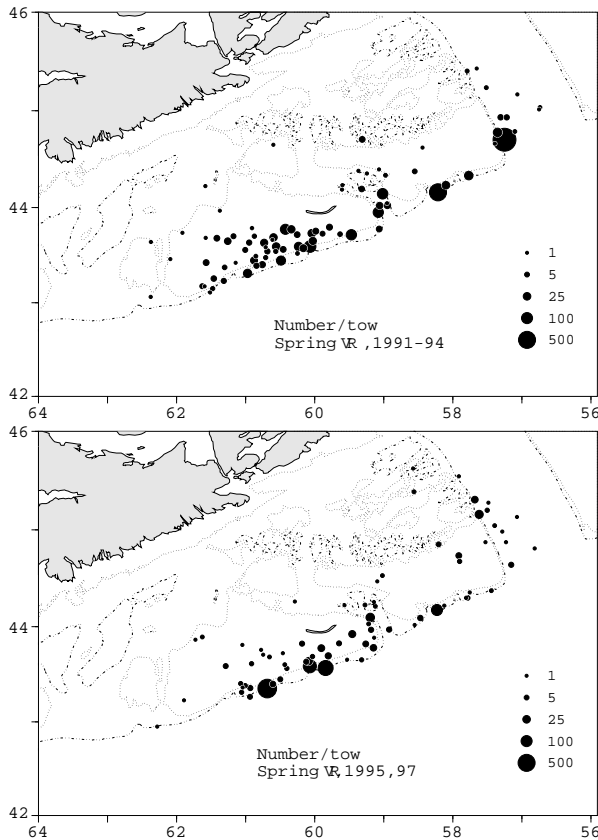
Resource Status

Winter skate range from south of Georges Bank to the Gulf of St. Lawrence and are near their northern limit of distribution on the offshore banks of the eastern Scotian Shelf. From observations of discontinuities in distribution, it is inferred that fish in Div. 4VsW are probably an isolated and self-reproducing population.

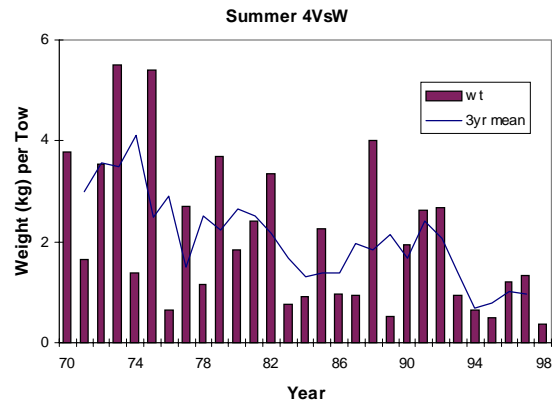
The distribution of winter skate from the summer RV survey prior to the directed fishery revealed that winter skate were concentrated on the eastern banks and adjoining slope waters of the Scotian Shelf. Winter skate were also concentrated on Browns Bank and in the upper Bay of Fundy. The distribution of winter skate after commencement of the directed fishery revealed an overall reduction in abundance on the eastern shelf. In 4X, winter skate appear to have increased in the Browns Bank region and to have remained stable in the Bay of Fundy.



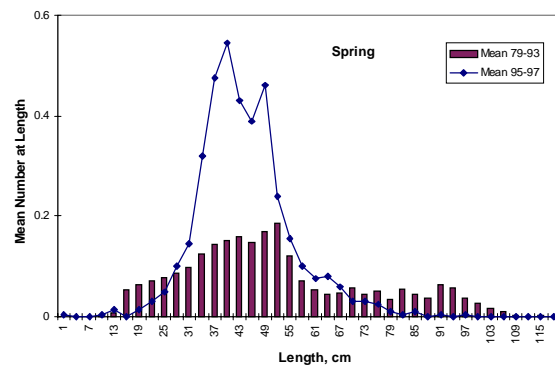
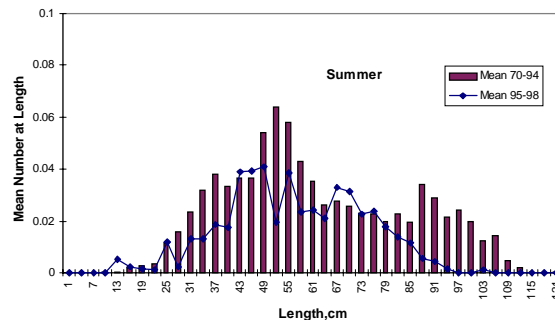
Distributional changes were suggested from the spring RV survey. A comparison of the pre- and post- fishery periods indicate that winter skate are now more concentrated in the slope waters along the edges of Banquereau, Sable and Western banks.



The mean weight per tow from the summer RV survey indicates a progressive reduction since the beginning of the survey series. The 1998 estimate is the lowest in the series.



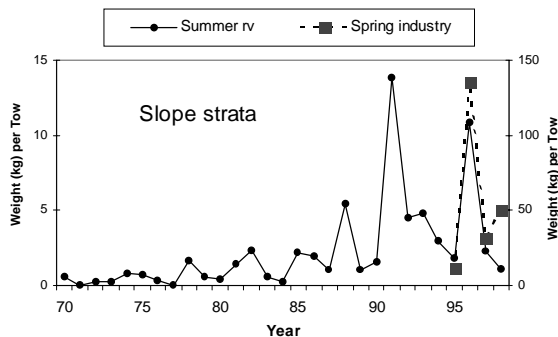
A comparison of the mean catch at length in 4VsW for the 1970-94 and 1995-98 summer surveys indicate a reduction in the abundance of winter skate > 85cm. A similar reduction was seen in the spring RV survey, although a greater number of 35-50cm winter skate were evident in the most recent time period. In 4X, no similar reduction of larger fish was evident.



As part of the Conservation Harvesting Plan for skates established in 1994, industry agreed to conduct two **industry/science skate directed-**

surveys in 4VsW. In 1994, an exploratory skate survey was initiated, with science designating the fishing locations and the use of 155mm mesh gear. In 1995, a random stratified survey design was used with 255mm mesh gear. In 1996, the survey gear reverted back to 155mm mesh in order to provide more complete sampling of the size range of the population.

A comparison of the **catch rates** from the industry survey and the corresponding strata from the summer RV survey shows no consistent patterns. However, if only the **slope strata** are compared, the 1995-97 values from the spring industry survey follow the summer RV survey very closely. The generally increasing trend in the summer RV slope catch rate since 1985 suggests there may have been some movement towards the edges of the banks and possibly beyond the maximum depth of the industry and RV surveys.



An examination of the **length frequencies** from the industry surveys also indicate some loss of the largest individuals from the population, though not as dramatic as the fishery as a whole.

In 1996, a study of female winter skate **maturity** was initiated. The female gonads begin to develop at approximately 50cm, with first maturity occurring around 65cm. Fifty percent of females are mature at approximately 75cm.

Industry has noted females extruding complete purses (a leathery case containing the skate embryo) only in the late summer/early autumn in the area west of Sable Island. Some of these purses, maintained in an aquarium, have remained viable for over a year without hatching. If this long period of gestation is representative, this is important to our understanding of population dynamics.

Estimates of **total mortality (Z)** on the Scotian Shelf were derived from an analysis of commercial catches using a growth model, derived from an ageing study of winter skate on the Scotian Shelf, to convert lengths to ages. Due to the preliminary nature of this model, a growth model from an Irish Sea skate, *Raja brachyura* (Holden,1972) with a growth pattern similar to that of winter skate was used for comparison. The resulting Z's are given below.

Z	Scotian Shelf growth model	Irish Sea growth model
1995	.35	.47
1996	.54	.74
1997	.76	1.03
1998	.73	.99

Results show that total mortality has increased rapidly since the inception of the directed fishery and it is unlikely that the population can sustain this level of mortality. Assuming M is about 20%, a Z value of .7 infers an annual exploitation of about 36 %.

Outlook

Harvest levels were initially based upon a percentage of the total biomass of all skate species. However, it was found that the fishery targeted only winter skate. The TAC was reduced to reflect the available biomass of mature winter skate which was considerably lower.

The winter skate is not widely distributed and occurs at the northern limit of its geographic range. Consequently the directed fishery for this species is very localised and these attributes may increase its vulnerability to overfishing. Increased catch rates in the slope waters may be related to changes in water temperatures and the possibility exists that winter skate distribution has expanded to depths outside our survey area.

Although the commercial catch rate series is too short and variable to detect a trend, the rapid loss of larger fish in the population indicates that it is overexploited. Maturity and reproductive information shows that an increasing proportion of the fish caught are now sexually immature and have not had a chance to spawn. Like other elasmobranchs, skates produce very few young each year and thus are slow to increase in population numbers.

Total mortality rates based on population size structure have more than doubled over the past four years and are extremely high for such a slow growing species.

Given the response of the 4VsW skate population to the 1994 to 1998 fishery, there are concerns that any directed fishery on this species cannot be sustainable. However, if the 'developing' fishery is to continue, harvest levels need to be reduced substantially to no greater than 600t. Under present restricted groundfish fishing in 4VW, bycatch and discard levels of winter skate will be low, thus reducing the risk of overexploitation during a more restricted directed fishery.

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