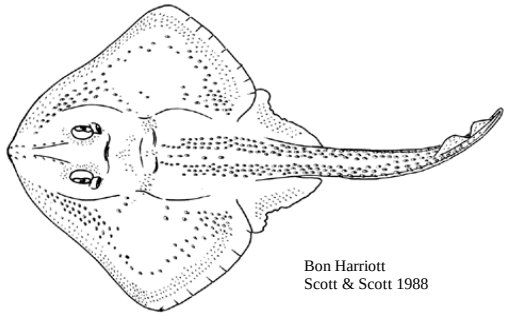
Fisheries and Oceans / Pêches et Océans
Maritimes Region

DFO Science
Stock Status Report A3-29 (2000)



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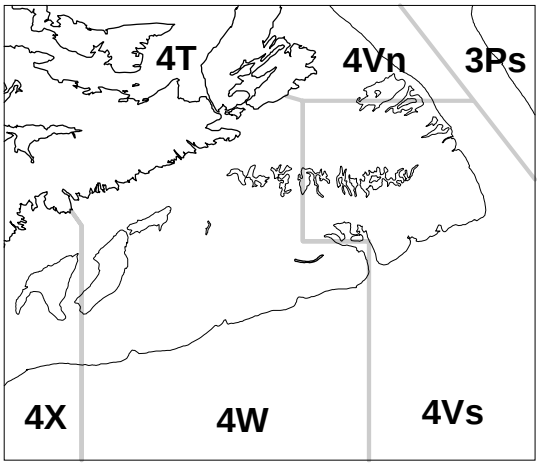


Winter Skate on the Eastern Scotian Shelf (4VsW)

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 (Raja ocelatta) 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 overlaps 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 bycatch 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 declined from 2152t in 1994 to less than 700t in 1999, reflecting progressive reductions in TAC. Discard estimates have declined from a high of 2100t in 1990 to less than 100t in 1999. Total removals amounted to 684t in 1999.
- Size of removals from the fishery peak at 71cm, whereas female winter skate are only 50% mature at 75cm.
- Commercial catch rates have not changed throughout the duration (1994-2000) of the experimental fishery.
- Mature fishable biomass has declined progressively from the beginning of the time series, with the 1998 estimate the lowest in the time series.
- There has been a progressive reduction in the proportion of larger winter skate in both the fishery and the summer research vessel (RV) survey.

- RV survey biomass shows a redistribution to deeper water in recent years.
- Fishing mortality should not be allowed to increase.

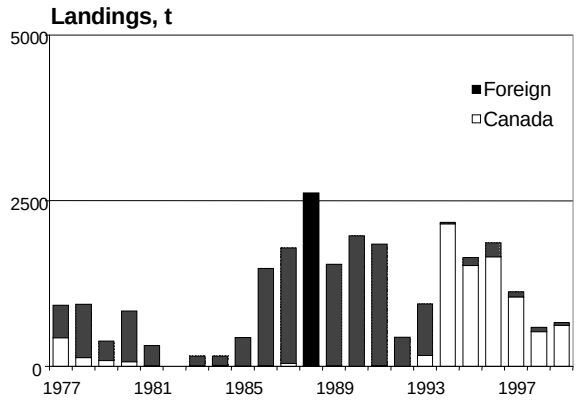
The Fishery

Landings (tonnes)

Year	1994	1995	1996	1997	1998	1999[5]	2000[6]
TAC[1]	2000	1600	1600	1200	1200	600	600
Canada[2]	2152	1530	1654	1048	526	623	
Est. Disc.[3]	136	126	81	68	51	38	
Foreign[4]	12	70	103	45	37	23	
TOTAL	2300	1726	1838	1161	614	684	

1. For 'developing' fishery only(all skate species).
2. Reported landings of all skate species by Canadian vessels.
3. Estimated discards of winter skate based on bycatch from Canadian groundfish directed fisheries.
4. Reported bycatch of winter skate by foreign vessels in the silver hake fishery.
5. TAC is for 1 January 1999 to 31 March 2000, while removals are for calendar year.
6. TAC is for 1 April 2001 to 31 March 2002.

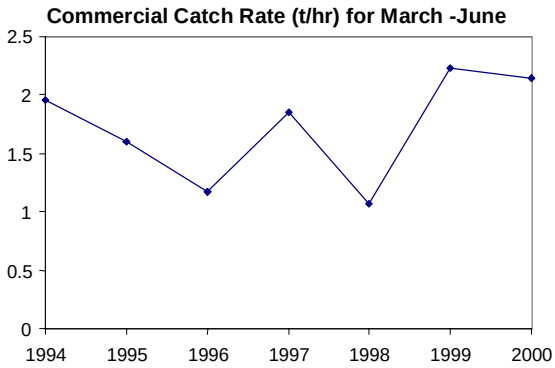
A developmental directed fishery for skates by Canada began in 1994, with a TAC of 2000t limited to four otter trawlers. In 1998, the directed fishery did not catch the TAC due to poor market conditions. The FRCC reduced the 1999 TAC to 600t, reflecting concern about the impact of the 'developing' fishery. Landings in the directed fishery have declined from 2152t in 1994 to less than 700t in 1999, reflecting progressive reductions in TAC. Discard estimates have declined from a high of 2100t in 1990 to less than 100t in 1999. Total removals amounted to 684t in 1999. Reported catches (to October 1st, 2000) were 340t in the Canadian directed fishery, 38t estimated from discards in other Canadian fisheries and 1t from the foreign fisheries.



Commercial sampling of winter skates began in 1995. The length frequency in 1995 peaked at 76cm and included many fish up to and greater than 100cm. In 1996, the peak shifted to 71cm and has remained there since. The percentage of fish greater than 90cm declined from 25% in 1995 to 6% in 1996 and less than 3% since 1997.

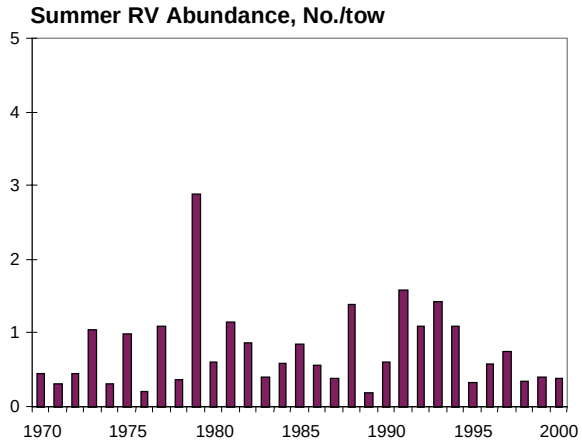
Resource Status

An examination of **commercial catch rates** of winter skate in spring revealed no significant changes since the beginning of the directed fishery. In 2000, the spring catch rate of 2.1t/hr was the second highest in the series.

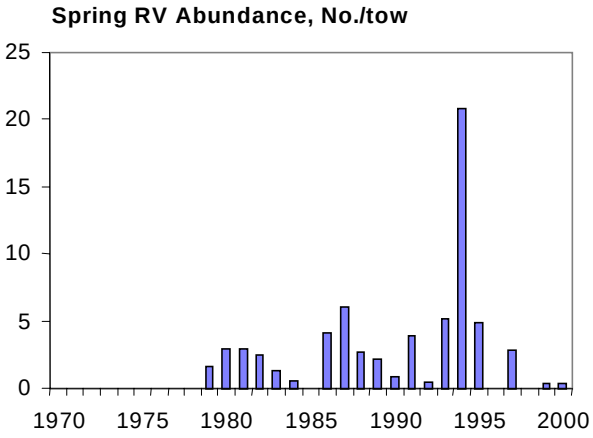


The **abundance** estimate from the summer research vessel (RV) survey in Div. 4VsW

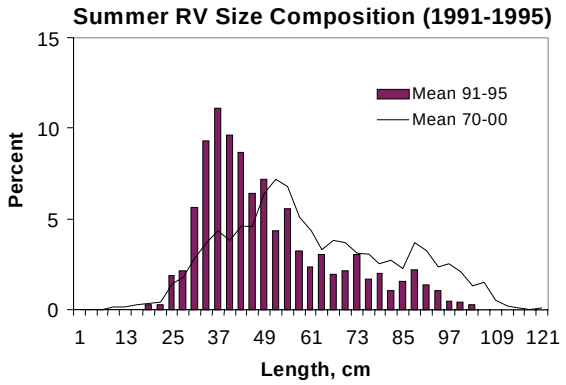
indicates no trend, though the 1995-2000 values have been below average.

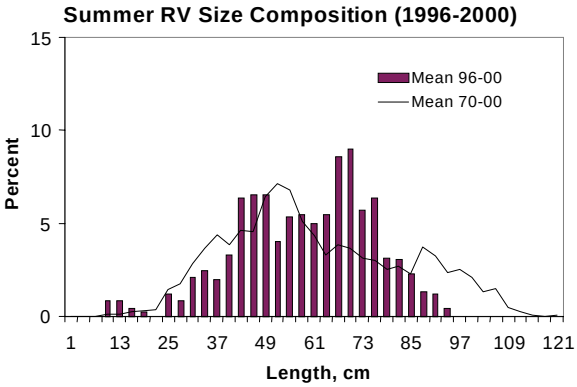


Abundance from the spring RV survey was variable with no patterns evident. The 1994 estimate was biased by a single tow of 1500kg. The 1999 and 2000 values were the lowest in the series.

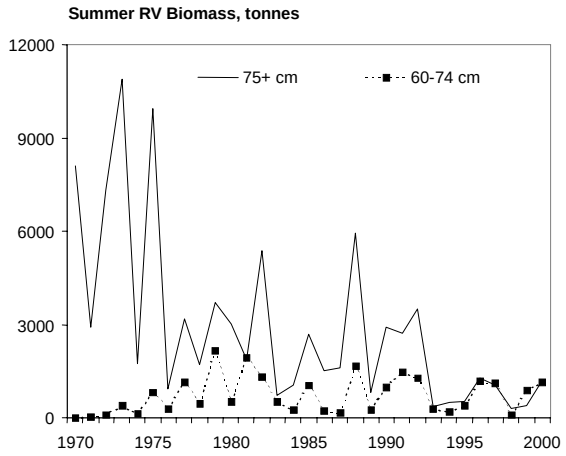


Changes in **length composition** relative to the long-term mean were evident during both the pre- (1991-1995) and post-directed (1996-2000) fishery. A shift in modal sizes from about 37 cm during the pre-fishery to about 70 cm during the post-fishery period was evident. While there were fewer fish > 85 cm seen in both periods, the reduction was greater in the most recent period.

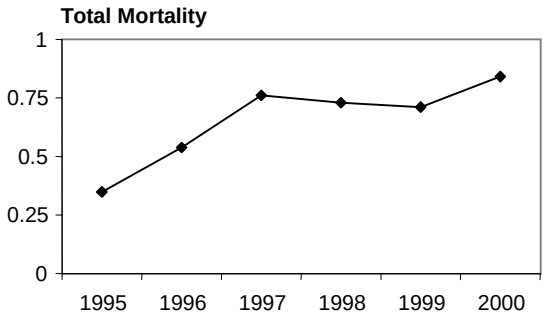




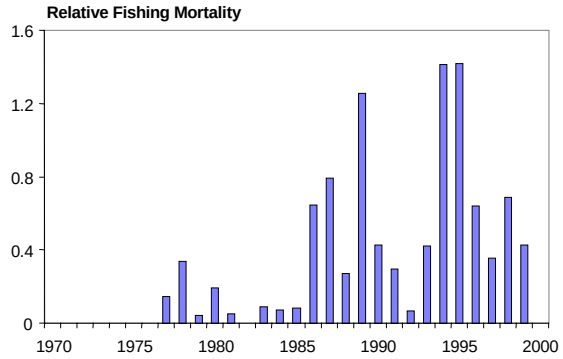
Annual estimates of **biomass** were made from the summer RV survey for 60-74 and 75+cm fish. The fishery generally exploits fish greater than 60 cm. Since size at 50% maturity of females is 75 cm, the RV survey was broken into immature (60-74 cm) and mature (75+ cm) fishable biomass. The immature fishable biomass was lowest in the early 1970's and peaked in 1979 with no trend evident since then. The mature fishable biomass declined progressively from the beginning of the series. The 1998 estimate was the lowest in the time series and a slight increase was noted in 2000.



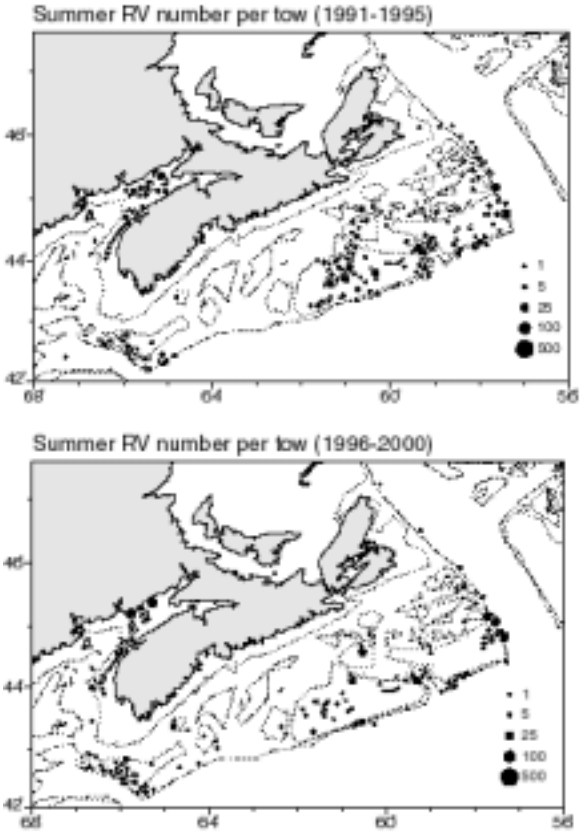
Estimates of **total mortality (Z)** were derived from an analysis of commercial length frequencies, using a growth model from an ageing study of winter skate on the Scotian Shelf to convert lengths to ages. These estimates doubled from 1995 to 1997 and have remained high. This reflects the loss of larger fish from the fishery. It may be indicative of mortality, a change in the way the fish are exploited, or movement of larger fish out of the area.



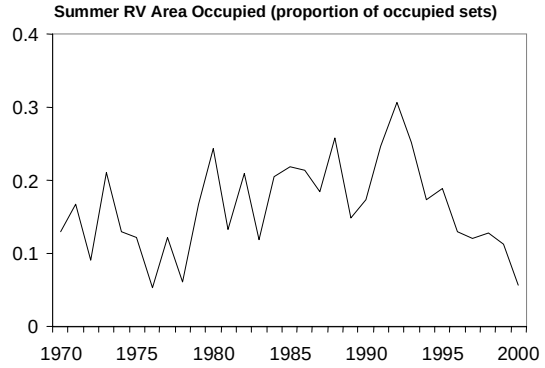
Relative Fishing Mortality, F (the ratio of catch divided by the summer RV biomass of winter skate) was calculated from 1977 to 1999. During the period preceding the directed fishery, relative F's were highest from 1986 to1989. Relative F's were high at the beginning of the directed fishery but have fallen as TAC's have been reduced.



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. Beginning in 1986, there was an overall reduction in abundance on the eastern Scotian Shelf with a possible shift in distribution towards the slope waters.

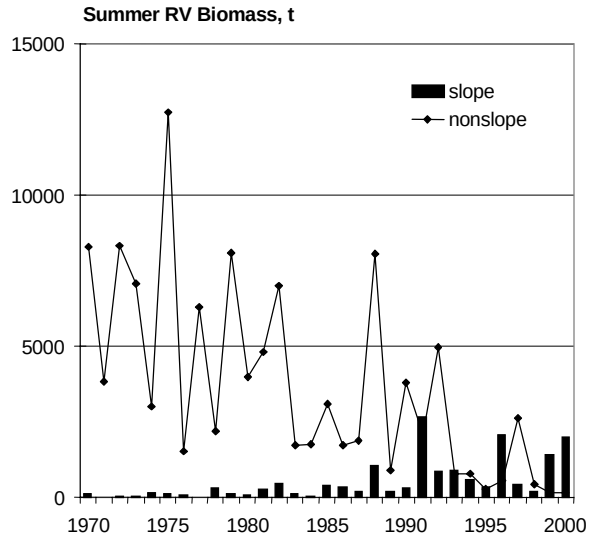


The **area occupied** (as indicated by proportion of RV sets in which winter skate occur) in Div. 4VsW in the summer RV survey was examined. In general, there was an increasing trend in the area occupied by the stock until 1992 with a subsequent decline. The 2000 estimate is close to the lowest in the time series.

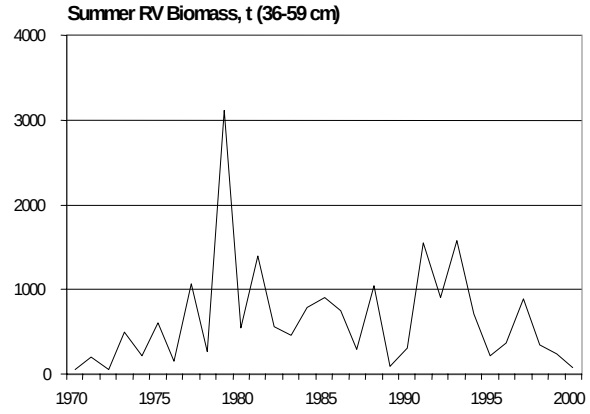


A shift in the distribution of winter skate in the spring RV, similar to that seen in the summer RV, had been noted prior to 1998. In 1999 and 2000, this pattern continued with most of the fish caught in the areas near the slope.

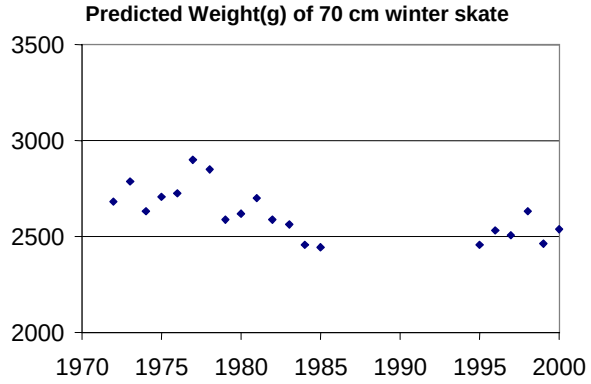
The summer RV survey biomass trends in Div. 4VsW were divided into **slope and non-slope** RV strata to examine this apparent shift. In general, there has been an increasing trend in biomass in the slope strata. In the non-slope strata, biomass has shown a steady decline since the beginning of the summer RV survey series.



Recruitment into the fishery was approximated by the biomass of 36-59 cm fish from the summer RV. This index appears to be variable, with some indication of increased recruitment between 1991-1994, although recent values have been low.

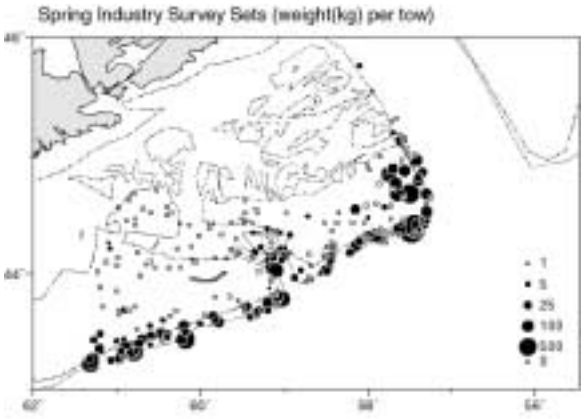


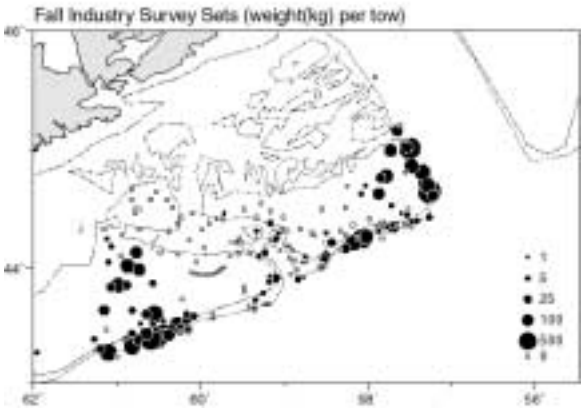
Condition, the relative weight of the fish at a given length from the summer RV survey was used as an indicator of the health of the fish. The predicted weight of a 70 cm (adult) winter skate during the last five years has averaged 2.5 kg., which is below the long term mean.



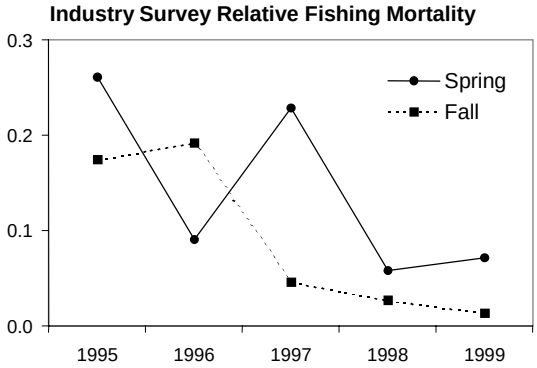
As part of the Conservation Harvesting Plan for skates established in 1994, industry agreed to conduct two **industry/science skate directed-surveys** per year in Div. 4VsW. In 1994, an exploratory skate survey was initiated, with science designating the fishing locations and the use of 155mm mesh gear. In 1995, a stratified random 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.

The **distribution** of winter skate from both the spring and fall industry/science surveys are similar to the summer RV survey. In the spring survey, most of the fish were found on the eastern shoal of Banquereau Bank and the slope waters that were surveyed. The pattern was the same in the fall survey, except for a concentration of fish west of Sable Island and a lack of fish in the Gully.



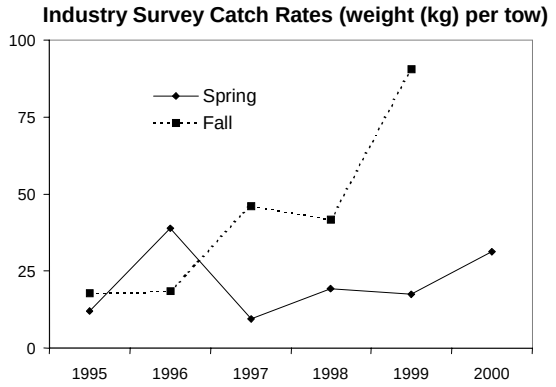


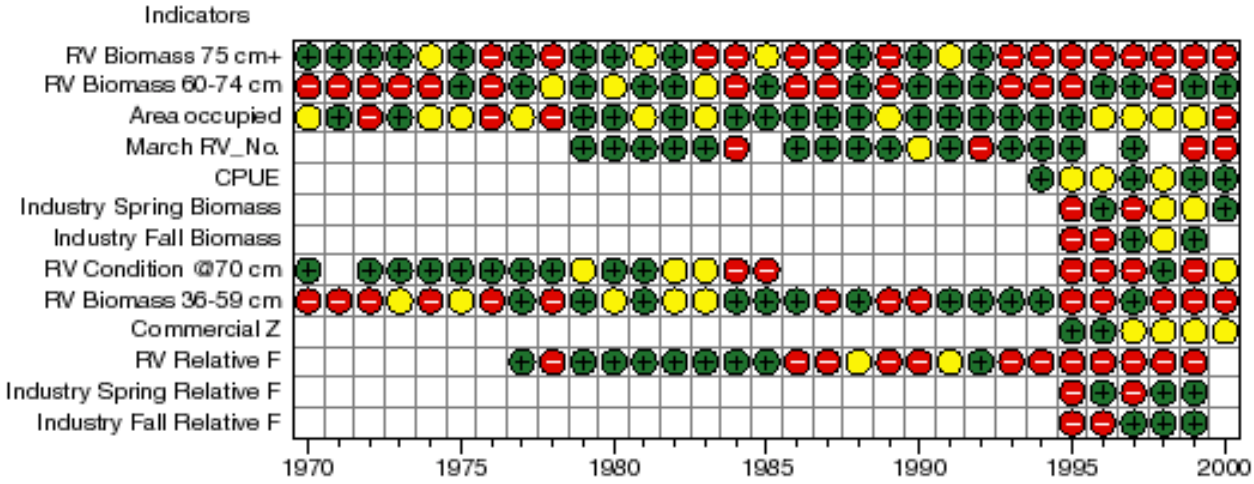
Relative fishing mortality (F) were calculated in the same manner as for the summer RV survey for the spring and fall industry surveys. These estimates were highest in 1995 and 1997 in the spring and have been below average in the last two years, while the fall estimates were high in 1995 and 1996 and have been much lower in the last three years



Winter skate **catch rates** (weight per tow) for the spring industry survey ranged from a low of 9.3 kg in 1997 to a high of 38.9kg in 1996. The 2000 estimate was 31.4kg. In the fall industry survey, catch rates ranged from a low of 17.8kg in 1995 to a high of 90.5kg in 1999. These data series are short and the inconsistencies between the spring and fall estimates prevent drawing any firm conclusions. However, these surveys provide no evidence of decline in the resource over the 1995-2000 period. The results suggest stability in the population, or possibly an increase.

The **Traffic Light** table that follows summarizes the indicators of stock status shown above. This table shows the annual values of each indicator as one of three lights depending on whether they are among the highest values observed for that indicator, among the lowest or in between. For indicators such as stock biomass and recruitment, high values are good and have a green light and low values are bad and have a red light. However, for indicators such as mortality, high values are bad and are assigned a red light⊖ whereas low values are good and receive a green light⊕. Intermediate values are yellow◯.





Outlook

Indicators of **abundance** show that the fishable component of the winter skate population, in aggregate, has been below the long-term mean in recent years. Spawning stock biomass (RV Biomass 75+ cm) has been consistently low, whereas the immature fishable biomass (RV Biomass 60-74 cm) has been above average in four out of the last five years. Area occupied has been declining steadily since 1992 and is currently at an historical low (Area occupied). The March RV No. indicator has also been low in recent years. Indicators based on the directed fishery and industry/science surveys (CPUE, Industry Spring Biomass, Industry Fall Biomass) have been either stable or increasing but are only available since 1995.

Several indicators suggest that **productivity** has been low since 1995. Condition factor was high throughout the 1970s and has been in the low part of the range since the mid-1990s (RV Condition @70 cm). Recent recruitment has also tended to be in the low part of the range (RV Biomass 36-59 cm). Total mortality, estimated from the directed fishery, doubled from 1995 to 1997 and has remained at a stable high level (Commercial Z).

There are three indicators associated with fishing **mortality** based on catch of skate in 4VsW versus RV biomass and biomass estimates from the spring and fall industry surveys. The fishing mortality indicator based on RV survey biomass estimates (RV Relative F) has been in the high part of the range during the past several years. The indicators based on biomass estimates from the industry surveys (Industry Spring Relative F, Industry Fall Relative F) available since 1995 suggest a recent reduction in exploitation that is consistent with falling TAC's in that period.

Long term data from the RV survey suggests that current levels of abundance and productivity are low. Industry data, available only since 1995, suggests that recent abundance has been stable. Skates are elasmobranches with slow growth and fecundity, life history characteristics, which make them susceptible to over exploitation. Hence fishing mortality should not be allowed to increase and continued monitoring is required.

For More Information

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