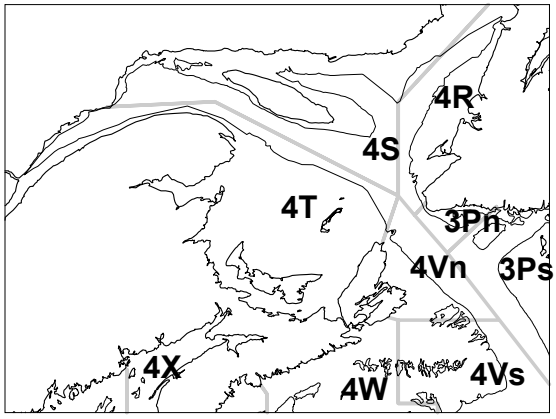
Witch Flounder (Divs. 4RST)

Background

Witch flounder are found in the deeper waters of the North Atlantic. In the Northwest Atlantic, witch range from the lower Labrador coast to Cape Hatteras, North Carolina. Relative to other flounders, witch are slow-growing and long-lived. Spawning occurs from spring to late summer, depending on the region, and in the Gulf of St. Lawrence (NAFO Division 4RST), spawners aggregate in channel waters in January and February. Spawning in the Gulf is believed to occur in deep water in late spring or early summer. The females are highly fertile, releasing as many as 500,000 eggs in a single spawn. In the late 1970s and early 1980s, 50% of females reached maturity at lengths of 40-45cm (9-14 years of age) and 50% of males matured at lengths of 30-34cm (5-8 years of age, Bowering and Brodie 1984). The fertilized eggs float and hatching occurs after several days, followed by a lengthy pelagic stage that may last a year. Juveniles eventually settle to the bottom in deep waters. In northern areas of their range, including the Gulf of St. Lawrence, witch flounder move into deep water during winter months and cease feeding. Witch grow faster in the Gulf of Maine and Georges Bank, where water temperature is higher and feeding occurs year-round.

Commercial fisheries for witch flounder developed significantly with the introduction of otter trawling to Newfoundland in the 1940s. Stocks in the Gulf of St. Lawrence became exploited in the 1950s when declining stocks caused Danish seiners in Fortune Bay, Newfoundland (NAFO Division 3Ps) to move to St. George's Bay in 4R. A small directed fishery for witch developed in St. George's Bay during the summertime, with offshore, winter catches of witch gaining in importance as bycatch in cod- and redfish-directed fisheries. The witch fishery expanded in the Gulf from St. George's Bay during the 1970s to the Esquiman Channel and the northern shores of Cape Breton Island.

Witch flounder in the northern Gulf of St. Lawrence (NAFO Division 4RS) came under quota management in 1977, with a precautionary quota of 3500 t. The first detailed assessment of 4RS witch was conducted in 1978 and continued yearly until 1981. During the 1980s, 4T landings increasingly dominated Gulf witch landings; however, the management unit remained as 4RS. In 1979, the TAC on 4RS was increased to 5000 t to remove an old and slow-growing component of the stock. This measure succeeded in reducing the age composition of the stock; however, landings declined and by 1982, the TAC was reduced to 3500 t. Stock assessments resumed in 1991 and following the recommendation of the Fisheries Resource Conservation Council in 1994, the management unit was extended to 4RST in 1995.



The most recent full assessment of the status of this stock was conducted in February 2001 (Stock Status Report A3-20 (2001)). This report updates fishery and survey data on this stock for 2002.

Summary

- In 2002, the TAC remained at 1000t. Total landings were 943 tonnes. Seine fleets directing for witch flounder caught their quota in both 4R and 4T.
- The research vessel survey biomass index for commercial sizes (30+ cm) increased from low values in 1993-1998 to moderate values in 1999 and 2000 but declined back to a lower value in 2001 and 2002.
- In contrast to other areas of the Gulf, the biomass index for eastern 4T has been at a high level since the mid-1990s.
- No clear biomass trends are evident from sentinel surveys of the northern Gulf (primarily 4R and 4S), though the 2002 catch rates are the lowest in the 8-yr time series for both the July and October surveys.
- A strong year-class, likely 1995, was observed in the research vessel survey of the northern Gulf from 1997 to 2001, and if this persists, the resource in 4RST should improve. However, this year-class did not appear to be strong in the 2002 survey.
- Stock structure is a major source of uncertainty for this resource.

The Fishery

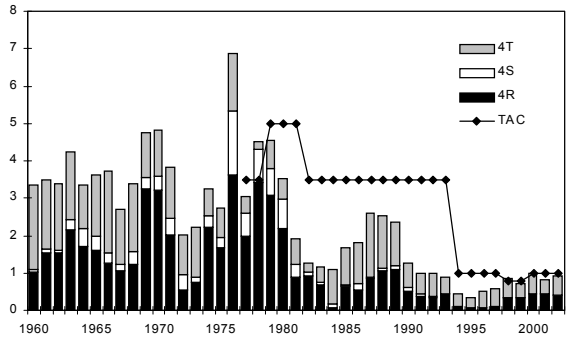
Landings and TAC's (thousand tonnes)

Year	Average 1982-89	Average 1990-94	Average 1995-99	2000	2001	2002*
TAC	3.5	3.0	0.9	1.0	1.0	1.0
Landing	1.8	0.9	0.6	1.0	0.8	0.9

* Preliminary statistics

Landings of witch flounder in NAFO Divs. 4RST exceeded 3000t in most years from 1960 to 1980. Landings declined to near 1000 t in the early 1980s but increased to near 2500t in the late 1980s. Landings declined in the 1990s, reaching very low levels in 1994 to 1997. Landings increased to the TAC in 1998 to 2000, but declined to about 80% of the TAC in 2001. The decline in 1994-1997 reflected very low landings from 4R. The decline in 2001 resulted from reduced landings in 4T. In 2002, seine fleets directing for witch flounder caught their quota in both 4R and 4T. Total landings in 2002 were 943t.

Landings (000s of t)



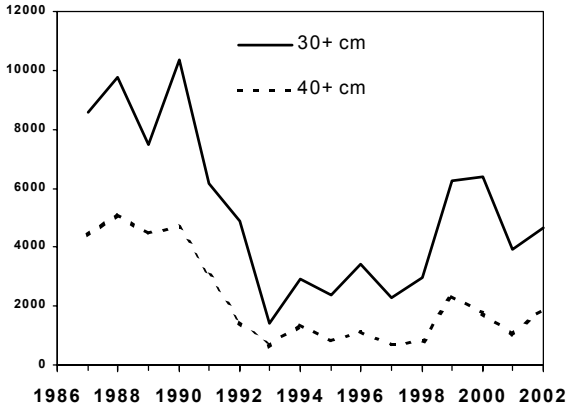
Since the mid-1980s, landings have been mostly by seiners directing for witch flounder between May and October in St. George's Bay, Newfoundland (4Rd) and off the west coast of Cape Breton Island (4Tf and 4Tg). The drop in landings in the 4R area in 1994-1997 reflected a sharp decline in fishing effort in this area. In this period, a high incidence of crab gear interfered with the fishery for witch flounder in 4R in early summer, a period when fishing effort was traditionally high. Fishing effort in 4R increased again in 1998, as did the landings. The seine fleet in 4R has caught its quota each year since 1998.

Since the mid-1990s, the fishery for witch flounder in 4T has opened later than has been traditional. This has prevented fishing during spring periods when catch rates have traditionally been high. In 2001, fishing for witch flounder in 4T was limited before May 15th because most fishers had caught their cod quota for the 15 May 2000 – 14 May 2001 management cycle. This contributed to the failure of the 4T fleet to catch its quota in 2001.

Resource Status

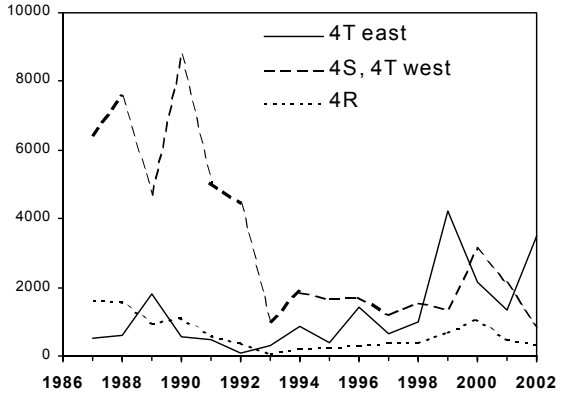
A biomass index for commercial sizes (30+cm) of witch flounder in 4RST is calculated by combining data from annual **research vessel (RV) surveys** conducted in the southern Gulf each September and in the northern Gulf each August. This index (the catch per tow expanded to the area surveyed) should reflect changes in witch flounder biomass over time but should not be taken as a measure of the actual biomass present in the area. A sharp decline in biomass occurred from 1990 to 1993. The index of biomass remained at a low but steady level from 1993 to 1998. It increased to an intermediate level in 1999 and 2000 but returned to a lower level in 2001 and 2002.

Survey Biomass Index



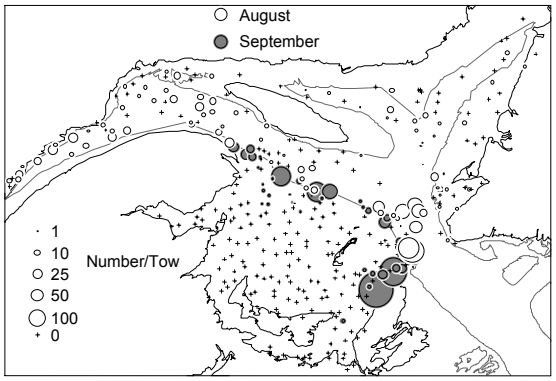
Changes in biomass have not occurred uniformly throughout the stock area. The biomass index declined in 4R, 4S and western 4T but not in eastern 4T. In recent years, biomass has been relatively high in eastern 4T, but has remained very low in 4S and western 4T. The large increase in the biomass index in 1999 was confined to eastern 4T. However, increases in the RV survey catch rates in 4R, 4S and western 4T also contributed to the relatively high biomass index in 2000. The survey index declined in all areas in 2001, remaining at a relatively high level only in eastern 4T. In 2002, the index declined further in 4S and western 4T and increased in eastern 4T.

Survey Biomass Index (30+ cm) by Area



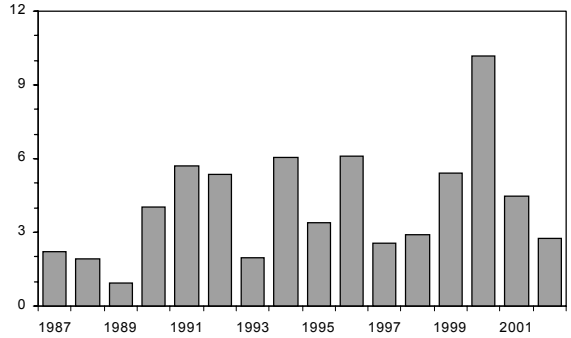
Catch rates of witch flounder in the RV surveys in 2002 tended to be highest in the Cape Breton Trough and along the southern slope of the Laurentian Channel. Catches were lower than usual throughout much of the northern Gulf, particularly in the Estuary and along the west coast of Newfoundland.

Catches of Witch Flounder in Standard Tows of the 2002 Research Vessel Surveys



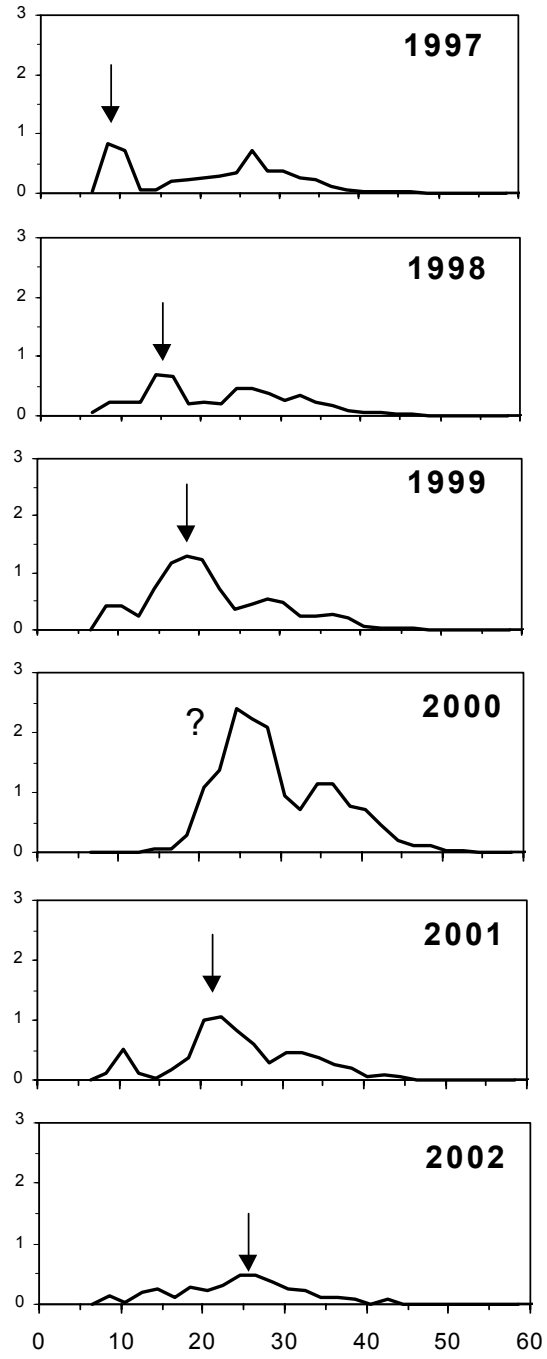
Pre-recruit abundance (fish 16-29cm in length) in the RV surveys fluctuated without trend between 1990 and 2002, with an exceptionally high value in 2000. Pre-recruit abundance has tended to be higher in the 1990s than in the late 1980s. However, the trawl used in the August survey changed in 1990 to one that is more efficient at catching small witch flounder. Although adjustments for this change in efficiency have been included in these analyses, based on the results of comparative fishing experiments, it is possible that these adjustments have not been entirely effective. Moreover, the time series of pre-recruit abundance is short, and it is unknown how recent values compare to the longterm average.

Pre-recruit Abundance Index (number/tow)



The August RV survey of the northern Gulf suggested the appearance of a strong year-class in the late 1990s. This year-class (probably the 1995 year-class) has been appearing at progressively larger sizes in the survey in most years since 1997. Pre-recruit abundance appeared to be especially great in the 2000 survey. This was interpreted as an indication of the recruitment of this year-class to the survey. However, this interpretation is not supported by catch rates in later surveys, suggesting that the high catch rates in the 2000 survey are partly due to an increase in catchability in that year. This year-class did not appear to be strong in the 2002 survey.

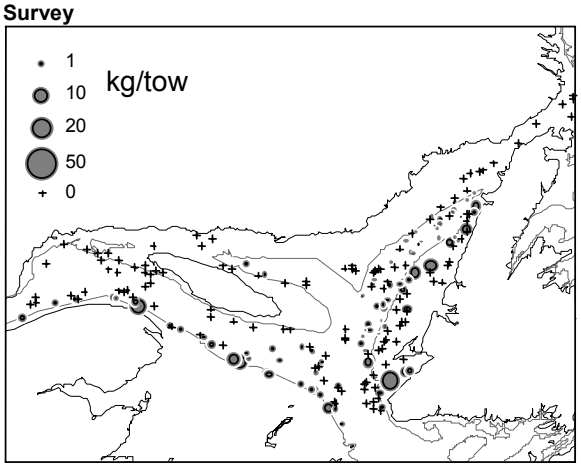
Length Composition (mean number / tow) of Witch Flounder Catches in the August Research Survey of the Northern Gulf (arrow indicates 1995 year-class)



Sentinel surveys conducted in the northern Gulf of St. Lawrence each July and October also provide information on relative abundance over much of the management unit, though they do not cover the Cape Breton Trough area nor the Estuary west of about 67°W, areas

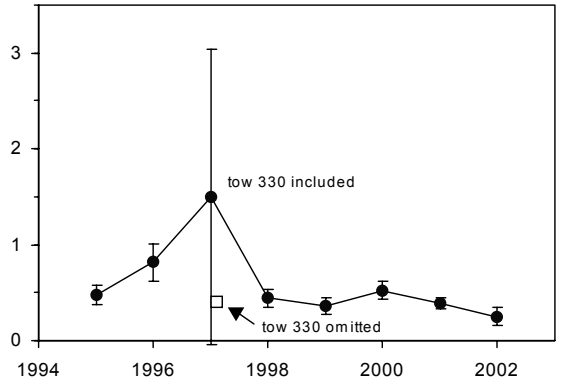
where RV catch rates are often high. Witch flounder catches in the 2002 sentinel surveys tended to be highest along the west coast of Newfoundland.

Catches of Witch Flounder in the October 2002 Sentinel Survey



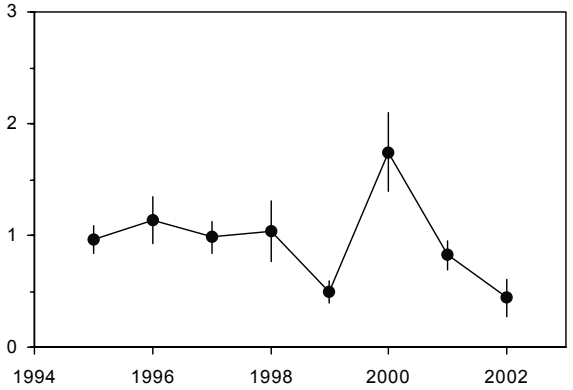
Catch rates in the July sentinel surveys reveal no clear trends in witch flounder biomass in the northern Gulf between 1995 and 2002. The high catch rate in the 1997 survey is due to a single tow. The increase in biomass suggested by including this tow in the index is not supported by the mean catch rates in subsequent years. The mean catch rate in 2002 is the lowest in the time series.

Catch Rates (kg/tow, ±1SE) of Witch Flounder in the July Sentinel Surveys of the Northern Gulf of St. Lawrence.



Catch rates in the October sentinel survey have also fluctuated without trend between 1995 and 2002. The mean catch rate in this survey was relatively high in 2000 and low in 2002.

Catch Rates (kg/tow, ±1SE) of Witch Flounder in the October Sentinel Surveys of the Northern Gulf of St. Lawrence



Sources of Uncertainty

Stock structure is a major source of uncertainty for this resource, affecting the interpretation of the regional differences observed in biomass trends in the Gulf. Biomass declines in the early 1990s were restricted to 4R, 4S and western 4T. Survey catch rates in eastern 4T (primarily in the Cape Breton Trough) have tended to be high since the mid-1990s. If witch flounder comprise a single stock over the 4RST area, these high catch rates in the Cape Breton Trough reflect a shift in distribution, with an increased proportion of the stock concentrated in this part of their range. On the other hand, witch flounder in the Cape Breton Trough may be linked to those in NAFO div. 4VW. A number of exceptionally strong year-classes have been produced on the Scotian Shelf in the 1990s, perhaps contributing to the increase in abundance of larger witch flounder in the Cape Breton Trough.

The subsequent declines in both RV and October sentinel survey catch rates suggest that the large increase in the survey biomass index for eastern 4T in

1999 and for the northern Gulf in 2000 may reflect changes in catchability. Contradictory results between the July and October sentinel surveys in 2000, with the biomass index increasing in the October survey but not in the July survey, are an additional source of uncertainty.

The apparent increase in pre-recruit abundance in the 1990s relative to the late 1980s is uncertain because the trawl used in the northern Gulf RV survey changed in 1990. Adjustments for the differences in fishing efficiency between the trawls used before and since 1990 may not have been entirely effective.

Outlook

The RV survey biomass index for 4RST witch flounder increased in 1999 and remained at this higher level in 2000. However, the biomass index returned to a lower level in 2001 and 2002. This decline, together with the information from the July and October sentinel surveys of the northern Gulf and the unusual change in length distribution in the 2000 RV survey, suggest that the high biomass index in 2000 may be partly due to an increase in catchability in that year. Although overall biomass was at a relatively low level in 2002, the index remained at a high level in the Cape Breton Trough area of eastern 4T. The interpretation of this high level in eastern 4T depends on stock structure, which is uncertain. Nonetheless, a strong year-class, likely the 1995 year-class, has been observed in the northern Gulf research survey since 1997. This year-class should soon be contributing to the fishery. If this indication of strong incoming recruitment persists, the witch flounder resource in 4RST should soon improve, notwithstanding the question of stock structure. However, catch rates were low in surveys of the northern Gulf in 2002, even at the lengths comprising this incoming year-class.

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