



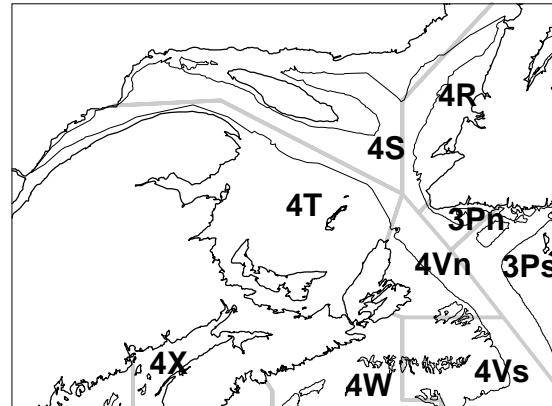
## 4RST Witch flounder (*Glyptocephalus cynoglossus*)

### 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 40-45 cm (9-14 years of age) and 50% of males matured at lengths of 30-34 cm (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 Fishery

The quota for 4RST witch flounder was 1000 t in 1997. The fishery was concentrated in 4T during 1997. Minimum mesh sizes for fleets fishing witch were 145-mm square mesh in codends in 4Rd and 155-mm square mesh in 4T. Many fishers in 4T reported using larger mesh sizes, including 160 and 165 mm. The minimum size limit for witch flounder remained at 30 cm, with temporary closures occurring if the catch of undersized fish was 15% or more by number. There were no fishery closures in 1997 caused by excessive catches of small witch flounder. Fishery closures were also imposed when bycatches of white hake exceeded 10% of the total weight of the catch, or cod bycatch exceeded 20% (4T) or 5% (4RS). The 4T fishery in 1996 was characterized by frequent closures due to excessive cod bycatch. Closures were infrequent in 1997 due to the increase in allowable cod bycatch from 10 to 20%. In 1997, closures were applied to individual vessels rather than to entire fleets. Opening of the fishery was delayed until late May to avoid high cod bycatch during the migration

into the Gulf. The 4T fishery was closed on October 31.

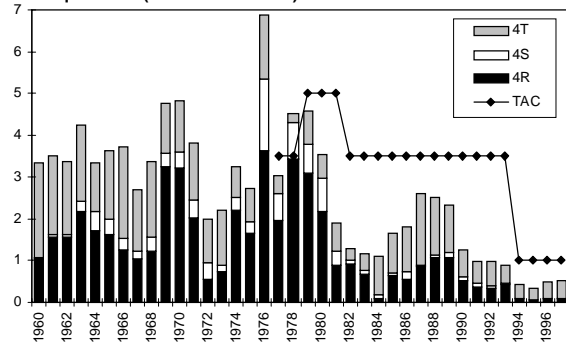
4RST witch flounder - landings in thousands of tons.

Year	70-79	80-89	90-93	94	95	96	97
	Avg.	Avg.	Avg.				
TAC <sup>1</sup>	4.0	3.8	3.5	1.0	1.0	1.0	1.0
Total	3.8	2.0	1.0	0.4	0.3	0.5	0.5 <sup>2</sup>

<sup>1</sup>TAC was first established in 1977.

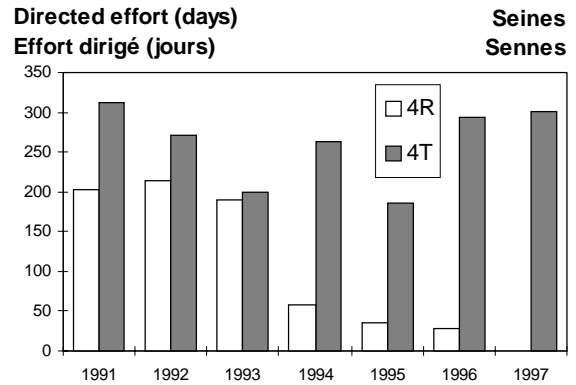
<sup>2</sup>Preliminary.

Landings ('000s of tonnes)  
Débarquements (milliers de tonnes)



Annual **landings** of witch flounder declined from about 2500 t in the late 1980s to an historical low of 320 t in 1995. Landings in 1996 and 1997 were about 500 t, well below the 3000-3500 t level sustained throughout the 1960s. Although landings in 4R have historically been an important component of this fishery, the bulk of the landings have been from eastern 4T since 1994.

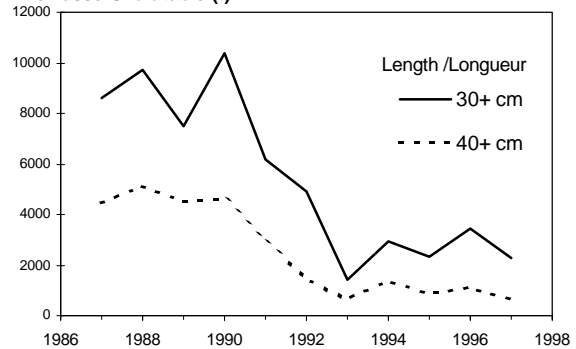
Danish seines are the dominant gear in this fishery and currently account for 85% or more of the landings. Directed **effort** by seines has remained roughly constant in 4T throughout the 1990s but declined sharply in 1994 in 4R where it has remained very low to the present. The decline in effort in 4R has been partly attributed to the closure of the cod fishery and the development of a crab fishery in the area.



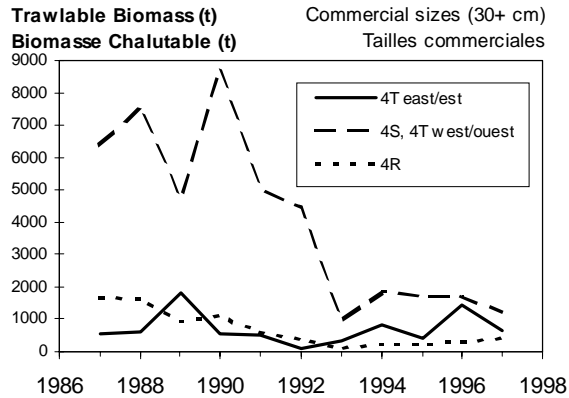
**Resource Status**

Age determination has not been undertaken for this stock. Resource status was evaluated using length-based analyses. **Abundance indices** for witch flounder over the entire 4RST area were calculated for the first time by combining data from research surveys conducted in the southern Gulf each September and in the northern Gulf each August. These indices suggest a sharp decline in **spawning stock biomass** from 1990 to 1993. Biomass estimates in 1994-1997 are about 20-30% of those in 1987-1990.

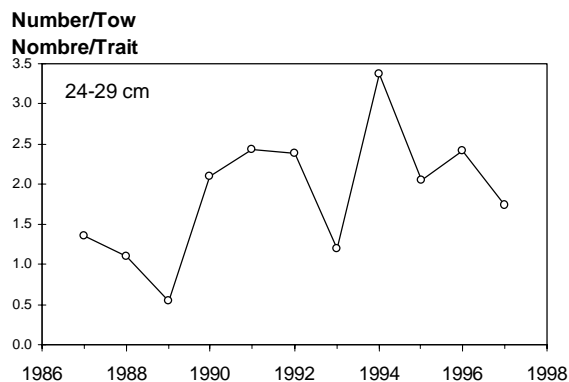
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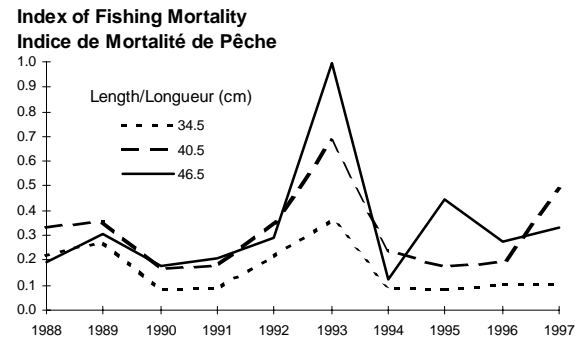
These declines in biomass have not occurred uniformly throughout the entire Gulf. Biomass declined in 4R, 4S and western 4T but not in eastern 4T.



Recent declines in abundance of witch flounder have been confined to the commercial sizes (30 cm and larger). Abundance of **pre-recruit witch** (24-29 cm in length) in survey catches has remained fairly constant since 1990 and tended to be higher in the 1990s than in the late 1980s. At even smaller sizes (<15 cm), abundance in survey catches was low from 1992 to 1996 but was high in 1997.



There is no evidence for trends in **fishing mortality** for this stock in recent years. A relative index of fishing mortality, the ratio of catch at length divided by survey estimates of population size at length, shows no clear pattern from 1988 to 1997. A spike in this index in 1993 may result from an anomaly or “year effect” in the survey in 1993 rather than from a large increase in mortality.



## Outlook

Landings of 4RST witch flounder are currently at an historical low, at about 20% of the levels seen in the late 1980s and 15% of those sustained throughout the 1960s. Research survey catches suggest that spawning stock biomass dropped sharply in the early 1990s to levels about 25% of those present in the late 1980s. Biomass appears to have remained low since 1993, even with landings at record low levels since 1994. Unless recruitment to this stock improves substantially, current catch levels are unlikely to permit any rebuilding of the stock and risk further declines.

## For more Information

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