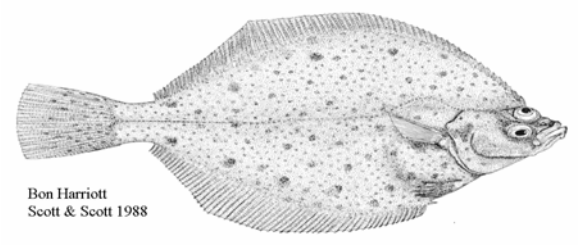
Fisheries and Oceans Pêches et Océans

Maritimes Region

DFO Science
Stock Status Report A3-15 (1998)



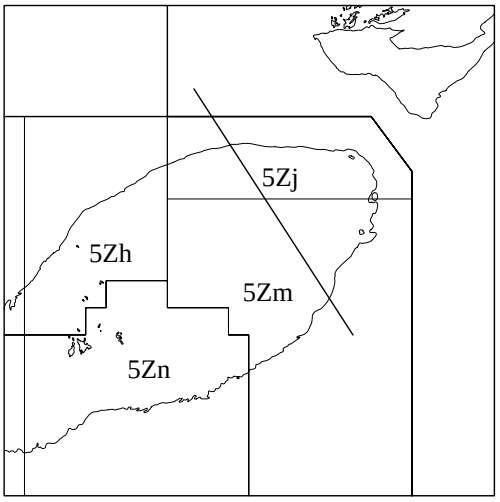
Yellowtail Flounder on Georges Bank

Background

Yellowtail flounder range from Labrador to Chesapeake Bay and are considered relatively sedentary. A major concentration of yellowtail occurs on Georges Bank to the east of the Great South Channel. While tagging work indicates limited movement from Georges Bank to adjacent areas, knowledge of seasonal movement of yellowtail flounder on Georges Bank is poor. Yellowtail flounder are most commonly caught at depths between 37 and 73 meters (20 and 40 fathoms).

On Georges Bank, spawning occurs during the late spring period peaking in May. From the distribution of both ichthyoplankton and mature adults, it appears that spawning occurs on both sides of the international boundary. Yellowtail flounder appear to have variable maturity schedules, with age 2 females considered 40% mature during periods of high stock biomass to 90% mature during periods of low stock biomass.

The Canadian fishery is mainly pursued using otter trawl gear from vessels less than 65'. The directed fishery for yellowtail flounder is a relatively recent development, with significant landings first occurring after the introduction of specialized gear in 1993. The trawls are equipped with small rollers and employ less headline flotation, giving a smaller vertical opening. The fishery occurs in a relatively limited portion of Georges Bank known as the Yellowtail Hole, and with current management restrictions, operates in the latter half of the year only. Both Canada and the USA employ the same management unit.



Summary

- Combined Canada/USA landings have been increasing in the past three years.
- Population biomass has been increasing since 1995.
- Recent recruitment is improved relative to the 1980s, but is poorer than in the 1960s.
- Exploitation rates have been low during the past three years.
- The combined Canada/USA yield at $F_{0.1}$ for 1998 ranged between 3,200 t and 5,500 t, depending on the assessment method. With combined catches of 1800 t, there is negligible risk of exceeding $F_{0.1}$, and high probability that the population biomass will increase.

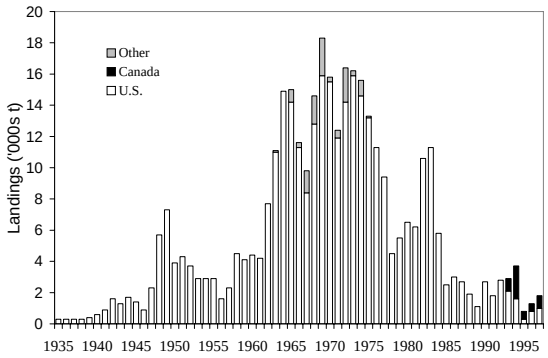
The Fishery

Landings (thousand metric tons)

Year	70-79 Avg.	80-89 Avg.	90-93 Avg	1994	1995	1996	1997
TAC[1]	-	-	-	-	0.4	0.4	0.8
Canada[2]	-	-	0.2	2.1	0.5	0.5	0.8
USA	12.0	5.2	2.4	1.7[3]	0.3[3]	0.8[3]	1.0[3]

[1] Canadian quota only.
[2] Canadian yellowtail landings, plus prorated unspecified flounder
[3] Estimated values, provided by US NMFS, include discards

Total landings of Georges Bank yellowtail flounder peaked during the mid 1960s through to the mid 1970s. The USA fishery has made most of the landings, although there were landings by other countries during the late 1960s and early 1970s. The Canadian directed fishery started in 1993, and peaked in 1994, with landings of 2,142 t. Under quota control for the first time in 1995, landings were 495 t against a quota of 400 t. In 1996, the TAC increased slightly to 430 t, and landings were 483 t (including an estimated 11 t of regulatory discards from the scallop fishery). The 1997 Canadian landings were 810 t, against a TAC of 800 t. No estimates of removals by the Canadian scallop fleet were available in 1997.



The **range of sizes** of the Canadian landings has been expanding over the past four years. The Canadian fishery catch at age has a higher proportion of older fish in 1997 compared with 1996.

Canadian landings of unspecified flounder from Georges Bank have been substantial in recent years (523 and 811 t in 1993 and 1994, respectively). Industry sources have indicated that most landings of unspecified flounders were yellowtail flounder. Total landings of yellowtail flounder were obtained by adding landings of known yellowtail plus a prorated amount of unspecified flounder (in proportion to the ratio of known yellowtail flounder, American plaice and winter flounder landings) in the unit areas 5Zj and 5Zm. With improvements in dockside monitoring, landings of unspecified flounder have decreased substantially from 71 t in 1996 to 32 t in 1997.

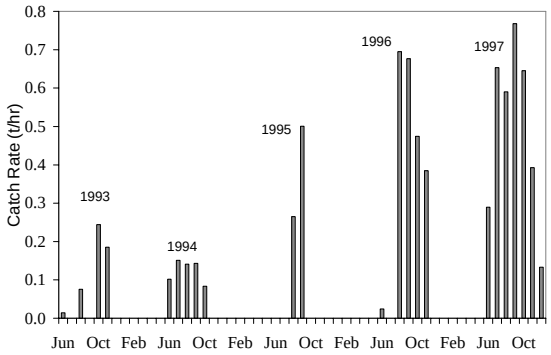
USA landings in 1997 were 1024 t. The principle fishing gear used in the USA fishery is the otter trawl, but scallop dredges and sink gillnets contribute some landings. In recent years, otter trawls caught greater than 95% of total landings from the Georges Bank stock, dredges caught 2-5% of annual totals, and gillnet landings were less than 0.1%. Current levels of recreational fishing are negligible. Discarding of small yellowtail is an important source of mortality due to intense fishing pressure, discrepancies between minimum size limits and gear selectivity, and recently imposed groundfish trip limits for the scallop dredge fishery. U.S. trawlers that land yellowtail flounder generally target multiple species on the 'Southwest Part' of the Bank and on the northern edge, just west of the closed area.

Resource Status

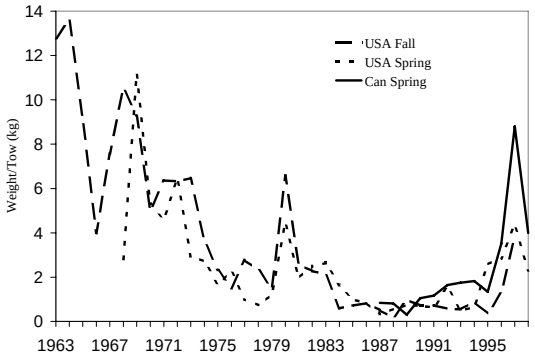
A virtual population analysis (VPA) was employed which incorporated indices of abundance from the USA and Canadian spring surveys, the USA fall survey and the USA scallop survey (young yellowtail flounder is a common bycatch in scallop surveys). In light of concerns over the reliability of the recent catch at age, an age-aggregated approach (referred to later as the

surplus production method) was also used. That approach required total catch as input, as well as indices of total biomass from the USA and Canadian spring surveys and the USA fall survey, but not age composition.

Canadian mobile gear **catch rates** have increased between 1994 and 1997. Factors other than abundance that may have caused such an increase were reviewed with industry, and it was concluded that the increases in catch rates probably reflect increased biomass. While catch rates may prove to be useful as an index of abundance for this resource, the time series is too short to be included directly in the assessment.



There are three groundfish **research surveys** conducted annually on Georges Bank that are used in the stock assessment. The mean weight per tow from the Canadian spring survey has been increasing up to 1997. In 1998, the survey value decreased, but remains high compared with values seen prior to 1996.



The USA spring survey series shows an increase since 1994, but biomass remains low, about half of that of the late 1960s and early 1970s. Similar to the Canadian spring survey, the USA 1998 (preliminary) value declined from 1997. The USA fall survey series follows a similar trend to the spring survey, but the increase was not coincident with that of the USA spring survey. This may be attributable to low sampling in key yellowtail flounder habitat during those years. Consistent with observations from the Canadian fishery, the size range of fish observed in the Canadian and USA spring surveys has been increasing over the past four years.

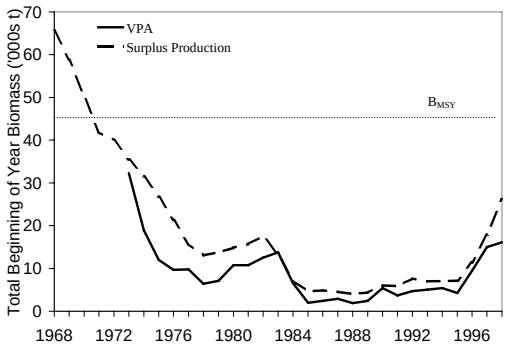
The **proportion** of biomass in the Canadian portion of the management unit has been 40, 70 and 55%, as indicated from the Canadian and USA spring and fall surveys, respectively (average of past five surveys). There is, however, considerable interannual variation in the proportion of biomass in Canadian waters.

Percentage of biomass on Canadian side

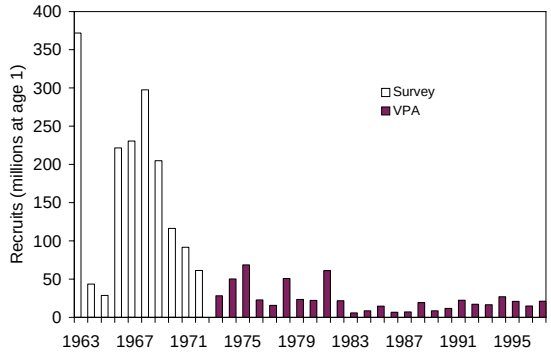
	Spring		Fall
Year	DFO	NMFS	NMFS
1992	22	72	72
1993	64	64	82
1994	21	54	70
1995	40	71	51
1996	53	73	22
1997	25	86	43
1998	60		

Estimates of **total biomass** from both assessment models show good concurrence. Both models indicate a steady decline in population biomass from the early 1970s, an increase in the early 1980s attributable to the strong 1980 year-class, then a decrease to under 3,000 t in 1988. Biomass has been recovering since then, and in 1998 was estimated as 26,220 and 16,128 t from the surplus production and VPA models, respectively. However, biomass remains

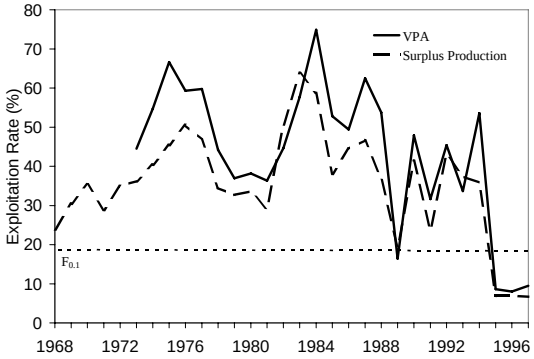
low compared to the biomass at maximum sustainable yield, as indicated from the surplus production model (44,000 t).



Recruitment estimates are available from the USA fall survey series (1963 to 1972) and from the VPA (1973 to 1997). Pre-1973 recruitment was considerably better than that observed more recently. Recruitment during the 1990s is slightly better than that observed during the 1980s. Last year, there was concern that the 1995 year-class was the smallest on record. However, those preliminary indications are not supported by the most current data.



The VPA and surplus production models produce similar patterns of **exploitation rate** over time. The exploitation rate was well above the target level of 20% during the 1983 to 1987 period, declined somewhat during the 1988 to 1994 period, and in 1995-1997 included the lowest values observed in the series.



Outlook

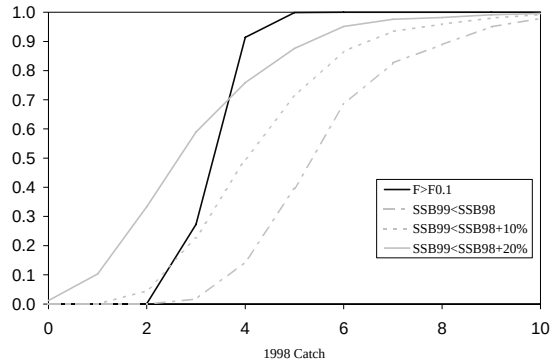
Since two assessment models were used, two projections are provided, with scenarios illustrating exploitation rates equivalent to the *status quo* F_{97} and for $F_{0.1}$. In the F_{97} option, the fishing mortality in 1998 is equal to that in 1997. The $F_{0.1}$ option implies an exploitation rate of 20% in 1998. For the production model, an approximation to $F_{0.1}$ was calculated.

		Yield 1998 (000s t)	Biomass 1998 (beg. year, total)	Biomass 1999
F_{97}	VPA	1.8	16.1	21.3
	Production	2.6	26.2	36.3
$F_{0.1}$	VPA	3.2	16.1	19.7
	Production	5.5	26.2	33.3

The VPA and surplus production approaches were both considered informative but provided divergent views on the projected population and yield. For the VPA approach, such differences may be attributed to poor sampling and the absence of age determinations from the Canadian fishery. The surplus production model attempts to describe long term average dynamics, which may not apply if recent recruitment has been weak.

The risk of not achieving fishery targets for population growth and exploitation rate from 1998 to 1999 was explored using

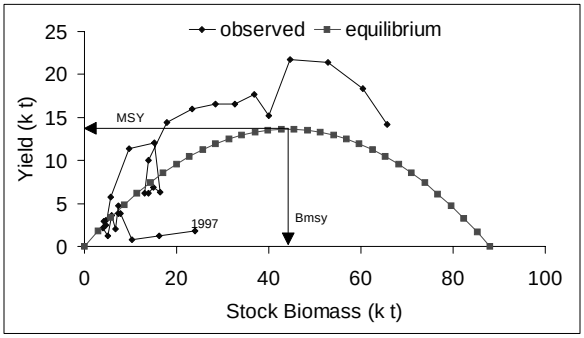
projections from the VPA at various levels of yields in 1998.



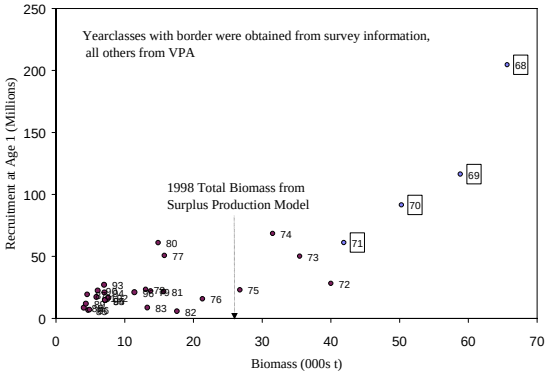
A fishery yield in 1998 equal to that of 1997 (1788 t) is associated with negligible risk of exceeding the $F_{0.1}$ fishing mortality target and has a low risk of not achieving growth in spawning stock biomass. The fishery yield associated with $F_{0.1}$ (3244 t), however, has a greater than 60% risk that a 20% growth in biomass will not occur. An approach to depict similar results from the surplus production model is under development, but is not yet available. Given the uncertainties in both the VPA and the surplus production model, the more conservative age-based projections and risk analyses from the VPA are risk-averse.

Management Considerations

The surplus production model allows a description of the potential yield from the resource at various biomass levels. The equilibrium relationship between yield and biomass is expected to be dome-shaped. As indicated below, recent management actions by both Canada and the USA have resulted in movement of the path of the relationship to the right, and continue to have the desired effect of rebuilding the population biomass.



There is a relationship between higher levels of biomass and the number of recruits produced. Total population biomass levels of less than 20,000 t have tended to produce weaker year-classes, on the average. As the population continues to grow, the probability of good recruitment should be enhanced.



In summary, the yellowtail flounder resource is rebuilding on Georges Bank. Recent estimates of exploitation rate are below commonly used targets such as $F_{0.1}$. Both assessment approaches indicate increasing population biomass. Other measures of stock abundance such as fishery catch rates and survey size composition support the view that the resource is recovering.

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References

Neilson, John D., and Steven X. Cadrin. 1998. 1998 Assessment of Georges Bank (5Zjmhn) Yellowtail Flounder. DFO Canadian Stock Assessment Secretariat Research Document 98/67.

This report is available from the:

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