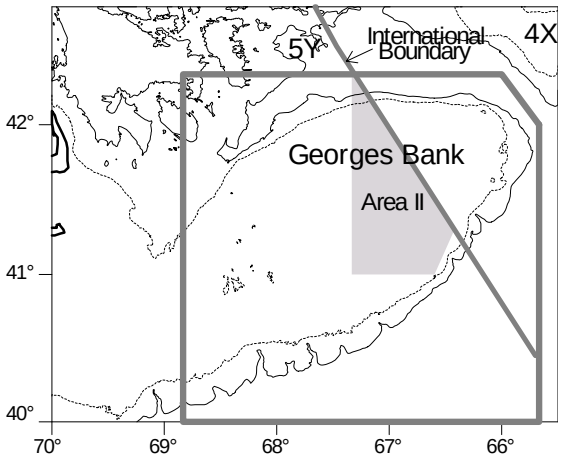
Transboundary Resource Assessment Committee

Status Report 2005/03 (Revised)

GEORGES BANK YELLOWTAIL FLOUNDER

[5Zhjmn; 522,525,551,552,561,562]



Summary

- Combined Canada and USA catches in 2004 were about 7,275 mt.
- Adult biomass (ages 3+) has generally increased from 2,000 mt in the mid 1990s but remains low at about 10,000 – 19,000 mt in 2005, indicating that stock rebuilding is needed.
- Recruitment has improved compared to the period 1980 to the mid 1990s, averaging 21 to 25 million age-1 fish during the past five years.
- Fishing mortality for fully recruited ages 4+ have been close to or above 1.0 between 1973 and 1994, declined to less than 0.6 in 2002 and 2003, well above the reference point of F_{ref} = 0.25, and increased in 2004 to above 1.0.
- Truncated age structure in the surveys and change in distribution indicate current productivity may be limited relative to historical levels.
- Assuming a 2005 catch equal to the 6,000 mt quota, a combined Canada/USA yield of about 2,100-4,200 mt in 2006 has a neutral risk, about 50%, of exceeding F_{ref} = 0.25. A combined yield below about 3,000 mt to 3,500 mt would be required to ensure a low risk of not achieving a 20% biomass increase from 2006 to 2007.

Catches, Biomass (thousands mt); Recruits (millions)

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Avg[1]	Min[1]	Max[1]
Canada	**Quota**	0.4	0.8	1.2	2.0	3.0	3.4	2.9	2.2	1.9	1.7			
	Landed	0.5	0.8	1.2	2.0	2.9	2.9	2.6	2.1	0.1		0.6	<0.1	2.9
	Discard	0.4	0.4	0.7	0.6	0.4	0.8	0.5	0.8	0.4		0.5	0.3	0.8
USA	**Quota**[5]									6.0	4.5			
	Landed	0.8	1.0	1.8	2.0	3.7	3.8	2.5	3.3	6.2		5.1	0.4	15.9
	Discard	<0.1	<0.1	0.1	0.5	0.4	0.3	0.2	0.4	0.5		0.6	<0.1	3.0
Total	**Quota**									7.9	6.0			
	Catch	1.7	2.3	3.8	5.0	7.4	7.9	5.9	6.6	7.3		5.7	0.5	16.3
	Base VPA													
	Adult Biomass[3]	3.5	5.1	6.4	7.9	10.4	11.0	9.9	12.8	16.3	19.0	8.3[2]	2.0[2]	26.4[2]
	Age 1 Recruits	13.2	18.5	24.1	26.1	22.3	25.9	38.0	33.3	13.8		24.1	6.6	70.6
	Fishing mortality[4]	0.63	0.71	0.78	0.69	0.87	0.91	0.56	0.49	1.16		1.03	0.49	1.81
	Exploitation Rate[4]	43%	47%	50%	46%	54%	55%	39%	35%	63%		58%	36%	78%
	Major Change VPA													
	Adult Biomass[3]	3.3	5.0	6.6	8.4	11.2	11.6	9.8	11.4	10.9	9.6	7.8[2]	2.0[2]	26.1[2]
	Age 1 Recruits	13.9	18.7	24.8	26.2	20.5	24.0	23.0	20.5	15.4		23.1	6.5	70.1
	Fishing mortality[4]	0.78	0.82	0.82	0.60	0.75	0. 80	0.52	0.59	1.75		1.12	0.52	2.10
	Exploitation Rate[4]	50%	52%	51%	41%	49%	50%	37%	41%	77%		60%	37%	82%

[1]1973 - 2004
[2]1973 – 2005
[3]ages 3+
[4]ages 4+
[5]for fishing year from May 1 – April 30

Fishery

Total catches of Georges Bank yellowtail flounder reached historical highs of about 20,000 mt during the mid 1960s to mid 1970s. The USA fishery took most of the catches, although there were catches by other countries during the late 1960s and early 1970s. The combined Canada/USA catch has been increasing since 1995, and in 2004 was 7,275 mt (Figure 1).

USA catches for 2004 were 6,757 mt, an 82% increase from 2003, with landings of 6,208 mt and discards of 549 mt. The Yellowtail Special Access Program in Closed Area II accounted for a large portion of these landings and discards. Discards came mostly from the trawl fishery with scallop fleet discards declining due to the fishery operating mainly in the Mid-Atlantic region. The trawl discards are more uncertain in the fourth quarter due to the fishery being closed causing estimation problems for the discard to kept ratio.

The **Canadian directed fishery** started in 1993 and landings of 2,139 mt occurred in 1994. Under quota control for the first time in 1995, landings were 464 mt. The 2004 Canadian catches were 518 mt, down 82% from 2003 and well below the 2004 TAC of 1,900 mt, with landings of only 96 mt and estimated discards of 422 mt. Canadian fishermen were unable to find commercial quantities of yellowtail in 2004, and the directed fishery ceased in September. The Canadian scallop fishery has not been allowed to land yellowtail flounder since 1996. Discards of yellowtail flounder in the offshore scallop fishery were estimated as part of the benchmark assessment review process in 2004 and are included in the 1973-2004 Canadian catch. In 2004, an estimated 422 mt of yellowtail were discarded by the offshore scallop fishery.

Ages 3-5 make up most of the **combined Canada/USA catch**, with very low catches of age 1 fish since 1995, following implementation of larger mesh in the cod end of commercial trawl gear in both countries. Ages 3 and 4 dominated both Canadian and US catches in 2004, with age 5 representing a significant portion as well. The Canadian fishery in 2004 was comprised mainly of fish in the 31-45 cm size range, while the USA fishery proportionately captured more large fish (31-52 cm), as was the case in 2003. Geographic differences between Canadian and US fisheries may account for some of the difference in length composition observed in 2004. Most of the US fishery catches (87%) and all of the Canadian catches (100%) occurred during the second and third quarters. Both the Canadian and US fisheries were well sampled in 2004.

Harvest Strategy & Reference Points

The Transboundary Management Guidance Committee has adopted a strategy to maintain a low to neutral risk of exceeding the fishing mortality limit reference, F_{ref} = 0.25. When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

State of Resource

The state of the resource was based on survey observations and the range of results from plausible age structured analytical assessments (VPA) that used fishery catch statistics and sampling for size and age composition of the catch for 1973 to 2004. The VPAs were calibrated to trends in abundance from three bottom trawl research surveys, NMFS spring, NMFS fall and DFO and a recruitment index from the NMFS scallop survey. Three VPA formulations were examined based on recommendations from the 2005 benchmark assessment review: 1) Base, the same formulation as used in the 2004 assessment, 2) Minor Change, expanded age range from 6+ to 12, dropped surveys for ages 1-3, and did not estimate terminal year ages 1-3, and 3) Major Change, expanded age range from 6+ to 12, split the surveys into separate series in 1995, estimated power functions for the relationship between indices at ages 1-3 and the calculated population abundance at those ages. The Minor Change VPA was not accepted during this TRAC review due to a large change in partial recruitment to the fishery for young ages in 2004 compared to the terminal year of the assessment reviewed during the benchmark. Retrospective analysis is used to detect a pattern of inconsistencies with a tendency to over or underestimate fishing mortality, biomass, and recruitment relative to the terminal year estimate. The Base VPA continues to display a retrospective pattern, updating population biomass estimates to lower values than previously determined and compromising interpretation of results, although the magnitude of the retrospective pattern is much less than in previous years. The Major Change VPA did not exhibit a consistent retrospective pattern, updates were both above and below previously estimated values.

Population biomass (ages 3+) either continued its increase from a low of 2,222 mt in 1995 to 19,079 mt in 2005 (Base VPA) or else increased from a low of 2,088 mt in 1995 to 11,587 mt in 2001 and fluctuated about 10,000 mt since then (Major Change VPA) (Figure 2). Spawning stock biomass in 2004 was estimated at 14,185 mt (Base VPA) or 8,475 mt (Major Change VPA). However, the retrospective pattern observed in the Base VPA has resulted in decreases to the terminal year spawning stock biomass to lower levels when updated, averaging 34% decrease over the past 5 years (range: 16% to 59% decrease) with the most recent update exhibiting a 24% decrease. In contrast, the Major Change VPA retrospective results have been both positive and negative over the past 5 years, averaging a 5% increase (range: 30% decrease to 39% increase), with the most recent update exhibiting a 39% increase.

Recruitment has improved compared to the period 1980 to the mid 1990s, averaging 27 million age-1 fish (Base VPA) or 21 million age-1 fish (Major Change VPA) during the past five years (Figure 2). Previous assessments had indicated the presence of some larger recruitment for these years, but their magnitudes have subsequently been estimated to be much smaller.

Fishing mortality for fully recruited ages 4+ have been close to or above 1.0 between 1973 and 1994, declined to less than 0.6 in 2002 and 2003 from both VPAs, well above the reference point of $F_{ref} = 0.25$, and increased in 2004 to above 1.0 (Figure 1). This contrasts with the perception of fishing mortality below F_{ref} from previous assessments. The lack of trend in the total mortality estimates from the surveys is not consistent with the VPA results since 1994, while the pattern exhibited by the relative F is similar.

Productivity

Age structure, fish growth, and spatial distribution reflect changes in the productive potential. In both absolute numbers and percent composition, the **population age structure** estimated by the VPA displays a truncated pattern with few old fish. The **spatial distribution** patterns in 2004 suggest a westward shift. Observed DFO survey average weights at length, used to reflect fish **condition,** did not change appreciably over the past decade. Truncated age structure in the surveys and change in distribution indicate current productivity may be limited relative to historical levels.

Outlook

The outlook is provided in terms of the possible consequences for alternative catch quotas in 2006 with respect to the harvest reference points. Uncertainty about standing stock generates uncertainty in forecast results. This uncertainty is expressed in the outlook as the risk of exceeding $F_{ref} = 0.25$ and as the risk that 2007 beginning of year biomass for ages 3+ would be less than a 20% increase over the 2006 biomass. The risk calculations provide a general sense of the uncertainties and assist with evaluating the consequences of alternative catch quotas. These calculations do not include uncertainty due to variations in weight at age, partial recruitment to the fishery, natural mortality, systematic errors in data reporting or the possibility that the model may not reflect the stock dynamics closely enough. Also, the risk calculations are dependent on the model assumptions and data used in the analyses. The assumptions in the two model formulations used were deemed plausible. The consequences of adopting action on the basis of one model if the other model was more appropriate can be evaluated from the risk results.

Assuming a 2005 catch equal to the 6,000 mt quota, recruitment in 2005 and 2006 set equal to 21.0 million (Base VPA) or 18.6 million (Major Change VPA) age-1 fish (geometric mean of the previous ten years), and a fishery partial recruitment estimated as the average of the previous three years, a combined Canada/USA yield of about 4,200 mt in 2006 has a neutral risk, about 50%, of exceeding F_{ref} according to the Base VPA but would result, with almost certainty, in exceeding F_{ref} according to the Major Change VPA (Figure 4). A combined yield as low as 2,100 mt in 2006, would be required to achieve a neutral risk of exceeding F_{ref} according to the Major Change VPA. A combined yield below about 3,000 mt or about 3,500 mt would be required to ensure a low risk of not achieving a 20% biomass increase for the Base VPA and Major Change VPA respectively.

If the Base VPA overestimates biomass, as indicated by the retrospective pattern, then calculated catch quotas for 2006 will be overly optimistic to achieve the F reference level. We cannot predict what the retrospective adjustment for 2006 will be. However, if the past five year average of 34% was applied to adjust the Base VPA catches, the 2006 TAC would be closer to the TAC from the Major Change VPA.

Medium term projections were not conducted due to uncertainties in the assessment including future recruitment.

Special Considerations

Consistent management by Canada and USA is required to ensure that conservation objectives are not compromised.

Both VPA formulations have difficulties with interpretation (see benchmark report for full details). The Base VPA has a strong pattern in residuals and a strong retrospective pattern. The Major Change VPA adds parameters to decrease these patterns in residuals and the retrospective, but the mechanism for the changes in survey catchability are not easily explained. These changes in survey catchability are most appropriately thought of as an aliasing of an unknown mechanism that produces a better fitting model.

Catching the TAC of 6,000 mt in 2005 will result in a fishing mortality rate above $F_{ref} = 0.25$ under both VPA formulations (0.40 Base, 0.82 Major Change). With an assumed total catch of 6,000 mt in 2005, the combined Canada/USA 2006 catch at F_{ref} would be 2,100-4,200[*] mt.

The benchmark review reconciled some of the conflicting results from last year's assessment. While there is still uncertainty about which model to use, concordance between the results from the two models gives more confidence in the determination of status than in the 2004 assessments. Both models indicate that stock rebuilding is necessary.

Source Documents

Stone, H.H., and C.M. Legault. 2005. Stock assessment of Georges Bank (5Zhjmn) yellowtail flounder. TRAC Reference Document 2005/04.

TRAC, 2005. R. O'Boyle, and W. Overholtz [eds]. Proceedings of the Transboundary Resources Assessment Committee (TRAC); 14–16 June 2005. TRAC Proceedings 2005/02.

TRAC, 2005. S. Gavaris, R. O'Boyle, and W. Overholtz [eds]. Proceedings of the TRAC benchmark assessment for Georges Bank yellowtail flounder. TRAC Proceedings 2005/01.

Correct citation:

TRAC. 2005. Georges Bank yellowtail flounder. TRAC Status Report 2005/03 (Revised).

[*] One tuning index was inadvertantly included in the Base case VPA that should not have been. Removing this index caused monor changes in the solution which were amplified in the projections resulting in a change for the 2006 catch from 3,600 mt to 4,200 mt.

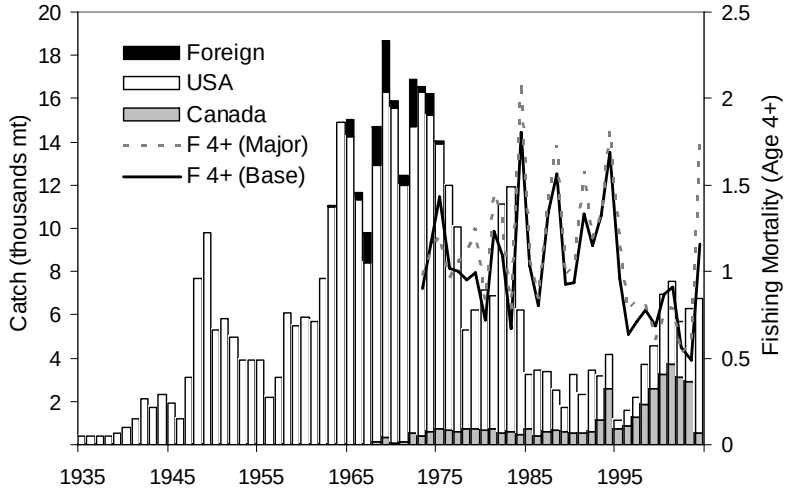


Figure 1. Catches and fishing mortality.

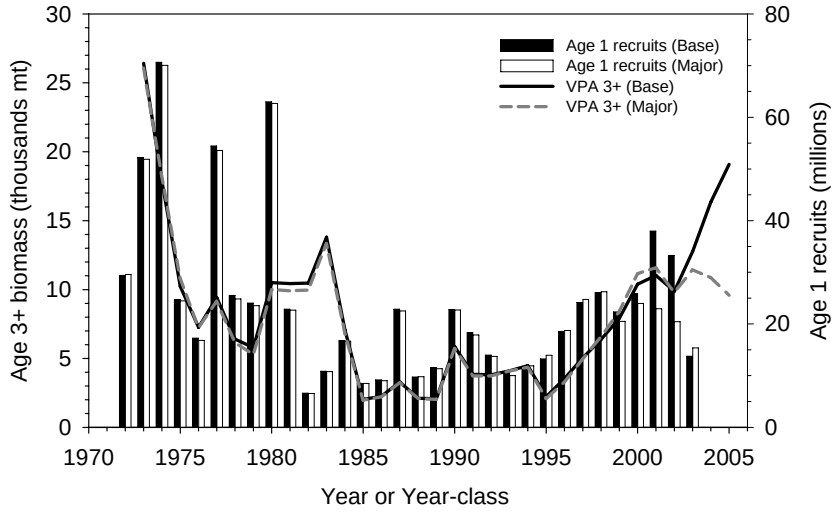


Figure 2. Biomass and recruitment.

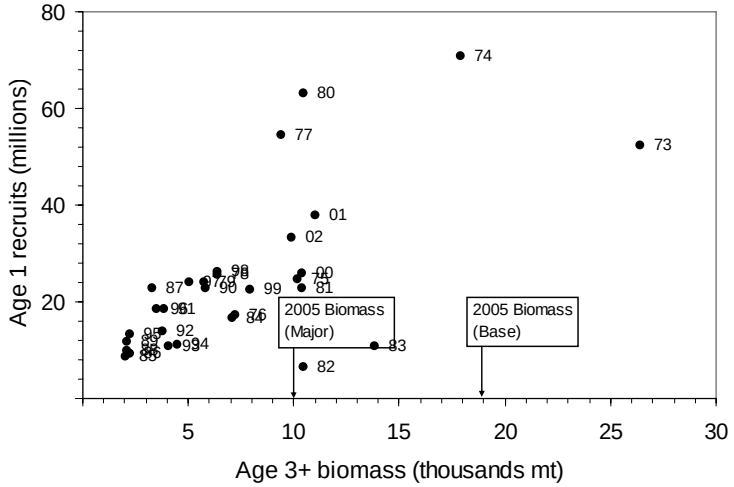


Figure 3. Stock recruitment patterns.

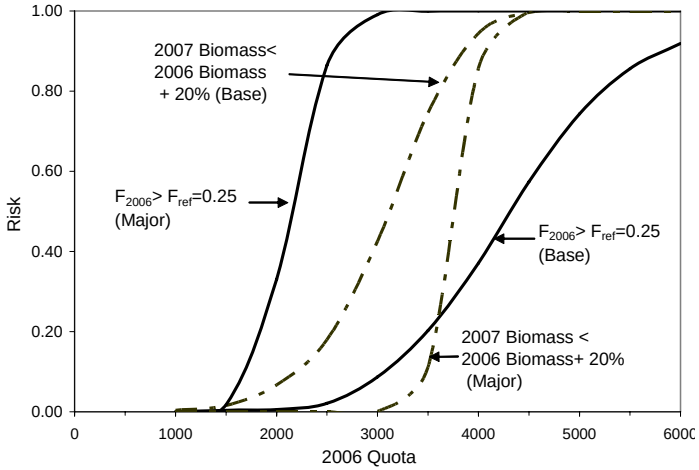


Figure 4. Projection risks.