

## Yellowtail Flounder in Divisions 3LNO

Advice June 2015

**Recommendation for 2016 and 2017**

Based on recent catch levels, fishing mortality up to 85%  $F_{msy}$  corresponding to a catch of 26 300 t in 2016 and 23 600 t in 2017 has low risk (5%) of exceeding  $F_{lim}$ , and is projected to maintain the stock well above  $B_{msy}$ .

**Management objectives**

No explicit management plan or management objectives are defined by Fisheries Commission. General convention objectives (NAFO/GC Doc. 08/3) are applied. Advice is provided in the context of the Precautionary Approach Framework (NAFO/FC 04/18).

Convention objectives	Status	Comment/consideration
Restore to or maintain at $B_{msy}$	●	$B > B_{msy}$
Eliminate overfishing	●	$F < F_{msy}$
Apply Precautionary Approach	●	Stock in safe zone of PA framework
Minimise harmful impacts on living marine resources and ecosystems	●	Bycatch regulations in place for moratorium stocks, general VME closures in effect
Preserve marine biodiversity	●	Cannot be evaluated

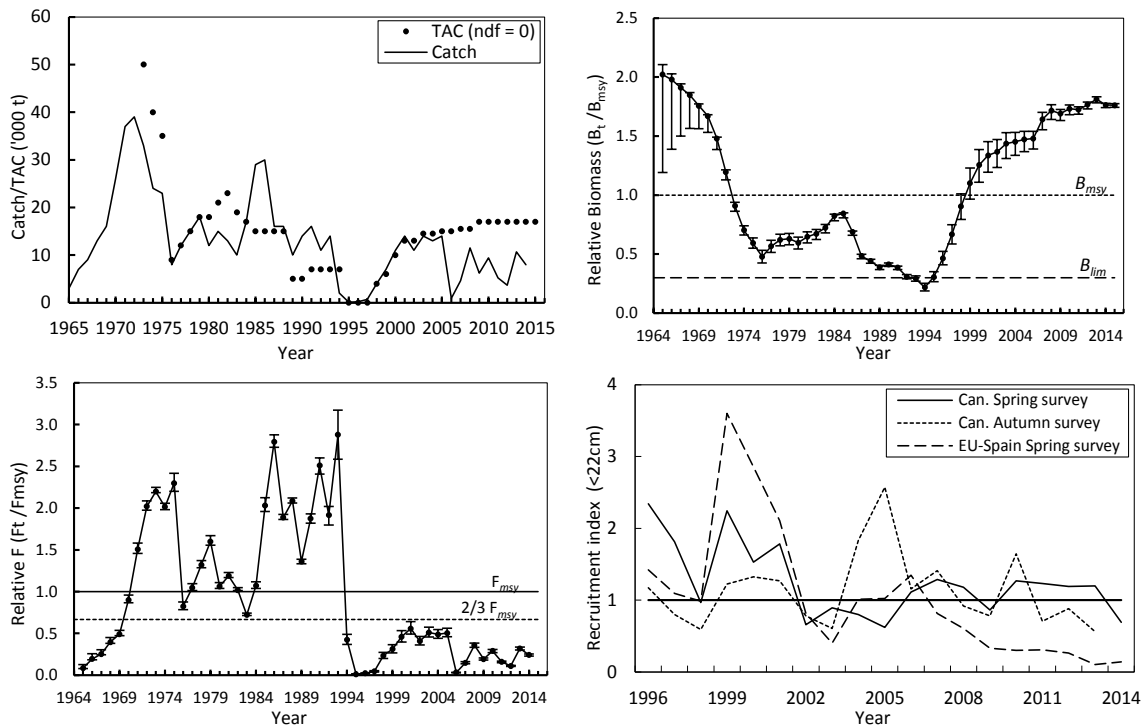
● OK  
● Intermediate  
● Not accomplished  
● Unknown

**Management unit**

The stock occurs in Divs. 3LNO, mainly concentrated on the southern Grand Bank and is recruited from the Southeast Shoal area nursery ground.

**Stock status**

The stock size has steadily increased since 1994 and is now well above  $B_{msy}$ . There is very low risk of the stock being below  $B_{msy}$  or  $F$  being above  $F_{msy}$ . Recent recruitment appears lower than average.

**Reference points**

$B_{lim}$  30%  $B_{msy}$

$F_{lim}$   $F_{msy}$  (STACFIS 2004 p 133).

## Projections

Projections were conducted assuming two levels of catch in 2015: TAC level (17 000t) and the average of the 2007-2014 catch (7 400 t) followed by constant fishing mortality from 2016-2018 at  $2/3 F_{msy}$ ,  $75\% F_{msy}$ , and  $85\% F_{msy}$ . Although yields are projected to decline in the medium term at both levels of catch in 2015, at the end of the projection period, the risk of biomass being below  $B_{msy}$  is less than 1% in all cases. The probability of biomass increasing in the projection period ( $P(B_{2018} > B_{2014})$ ) is <1%. The stock is well above  $B_{msy}$  and the projected levels of  $F$  result in catches higher than the estimated surplus production which will result in a decline in biomass toward  $B_{msy}$ .

Projections with Catch in 2015 = Average 2007-2014 catch (7 400t)				
Projected Yield ('000t) Median (80% CI)			Projected Relative Biomass ( $B_y/B_{msy}$ ) Median (80% CI)	
$\frac{2}{3} F_{msy}$				
2016	21.02	(19.69 - 23.01)	1.77	(1.75 - 1.77)
2017	19.52	(18.42 - 21.21)	1.61	(1.60 - 1.62)
2018	18.58	(17.66 - 20.02)	1.52	(1.50 - 1.54)
$75\% F_{msy}$				
2016	23.43	(21.95, 25.64)	1.77	(1.75 - 1.77)
2017	21.44	(20.25 - 23.27)	1.58	(1.57 - 1.60)
2018	20.21	(19.24 - 21.72)	1.47	(1.45 - 1.49)
$85\% F_{msy}$				
2016	26.26	(24.61 - 28.74)	1.77	(1.75 - 1.77)
2017	23.62	(22.33 - 25.59)	1.55	(1.53 - 1.56)
2018	21.97	(20.97 - 23.57)	1.42	(1.40 - 1.44)
$F_{msy}$				
2016	30.39	(28.49 - 33.24)	1.77	(1.75 - 1.77)
2017	26.60	(25.20 - 28.78)	1.50	(1.49 - 1.52)
2018	24.27	(23.25 - 25.98)	1.35	(1.32 - 1.37)

Catch 2015 = 7400 t									
F Level	Yield		P( $F_y > F_{msy}$ )			P( $B_y < B_{msy}$ )			P ( $B_{2018} > B_{2014}$ )
	2016	2017	2015	2016	2017	2016	2017	2018	
$2/3 F_{msy}$	21.02	19.52	<1%	<1%	<1%	<1%	<1%	<1%	<1%
$75\% F_{msy}$	23.43	21.44	<1%	<1%	<1%	<1%	<1%	<1%	<1%
$85\% F_{msy}$	26.26	23.62	5%	5%	5%	<1%	<1%	<1%	<1%

**Projections (cont.)**

Projections with Catch in 2015 = TAC (17 000t)				
Projected Yield ('000t) Median (80% CI)			Projected Relative Biomass ( $B_y/B_{msy}$ ) Median (80% CI)	
$\frac{2}{3} F_{msy}$				
2016	19.94	(18.70 - 21.80)	1.66	(1.65 - 1.67)
2017	18.85	(17.85 - 20.41)	1.55	(1.53 - 1.56)
2018	18.15	(17.31 - 19.50)	1.48	(1.45 - 1.50)
75% $F_{msy}$				
2016	22.22	(20.85 - 24.29)	1.66	(1.65 - 1.67)
2017	20.7	(19.62 - 22.40)	1.52	(1.51 - 1.53)
2018	19.72	(18.85 - 21.15)	1.43	(1.41 - 1.46)
85% $F_{msy}$				
2016	24.91	(23.37 - 27.22)	1.66	(1.65 - 1.67)
2017	22.79	(21.62 - 24.64)	1.49	(1.47 - 1.50)
2018	21.44	(20.53 - 22.95)	1.38	(1.36 - 1.41)
$F_{msy}$				
2016	28.82	(27.05 - 31.49)	1.66	(1.65 - 1.67)
2017	25.66	(24.38 - 27.69)	1.44	(1.43 - 1.46)
2018	23.66	(22.73 - 25.24)	1.31	(1.28 - 1.33)

Catch 2015 = 17 000 t (TAC)									
F Level	Yield		P( $F_y > F_{msy}$ )			P( $B_y < B_{msy}$ )			P ( $B_{2018} > B_{2014}$ )
	2016	2017	2015	2016	2017	2016	2017	2018	
$\frac{2}{3} F_{msy}$	19.94	18.85	<1%	<1%	<1%	<1%	<1%	<1%	<1%
75% $F_{msy}$	22.22	20.70	<1%	<1%	<1%	<1%	<1%	<1%	<1%
85% $F_{msy}$	24.91	22.79	5%	5%	5%	<1%	<1%	<1%	<1%

**Assessment**

A surplus production model was used (STACFIS 2015). The results were consistent with the previous assessment and are considered to be reliable. Input data comes from research surveys and the fishery (STACFIS 2015) and is considered good quality. Next assessment: 2017.

**Human impact**

Mainly fishery related mortality has been documented. Other sources (e.g. pollution, shipping, oil-industry) are undocumented.

**Biology and Environmental interactions**

As stock size increased from the low level in the mid-90s, the stock expanded northward and continues to occupy this wider distribution. This expansion of the stock coincided with warmer temperatures; temperatures continue to warm, and will likely not limit the stock distribution in the near future.

Despite the increase in stock size observed since the mid-90s, the average length at which 50% of fish are mature has been lower for both males and females in the recent period. There also seems to have been a slight downward trend in weight at length since 1996. The cause of these changes is unknown.

**Fishery**

Yellowtail flounder is caught in a directed trawl fishery and as by-catch in other trawl fisheries. The fishery is regulated by quota and minimum size restrictions. Catches in recent years have been low due to industry-related factors. American plaice and cod are taken as by-catch in the yellowtail fishery. There is a 15% by-catch restriction on American plaice and a 4% limit on cod.

Recent catch estimates and TACs ('000 t) are as follows:

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TAC <sup>1</sup>	15.0	15.5	15.5	17	17	17	17	17	17	17
STATLANT 21	0.6	4.4	11.3	5.8	9.3	5.2	3.2	10.5	8.0	
STACFIS	0.9	4.6	11.4	6.2	9.4	5.2	3.1	10.7	8.0	

<sup>1</sup> SC recommended any TAC up to 85%  $F_{msy}$  in 2009-2015.

#### **Effects of the fishery on the ecosystem**

Fishing intensity on yellowtail flounder has impacts on Divs. 3NO cod and Divs. 3LNO American plaice through by-catch. General impacts of fishing gears on the ecosystem should also be considered.

#### **Special comments**

Catch of yellowtail flounder has been below TAC in recent years. If catches increase, fishing mortality on Divs. 3NO cod and Divs. 3LNO American plaice will also increase.

#### **Sources of information**

SCR Docs. 11/34, 15/08, 026, 029; SCS Docs. 15-05, 6, 7, 8, 9; NAFO/GC Doc. 08-3; NAFO/FC Doc. 04-18