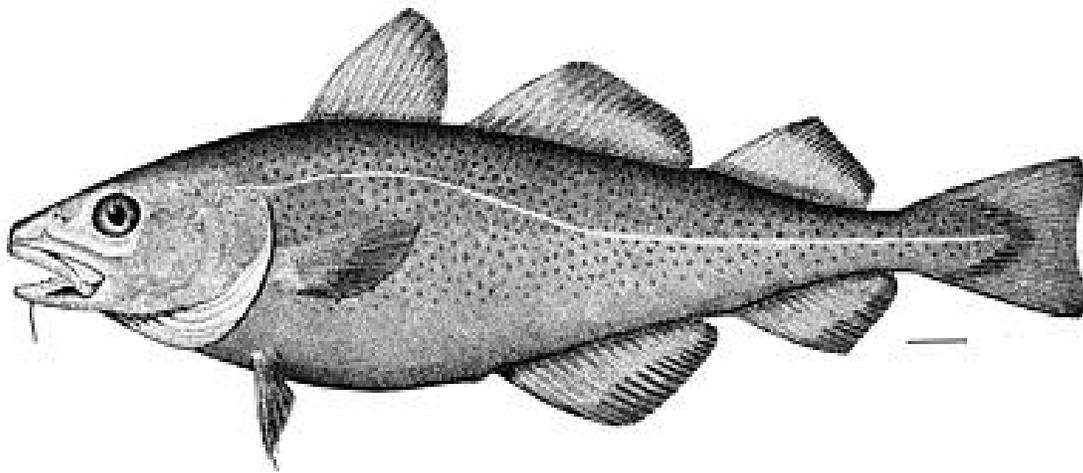


Draft Presentation
For Peer Review Only.
Does not represent
final NOAA Decision/Policy.
4/29/08

The Gulf of Maine stock of Atlantic cod



Description and history of current approach.

The most recent peer review occurred at SAW 31 in 2001 (Mayo et al. 2002). Since then updated assessments were reviewed at GARMI (2002) and GARMII (2005) Mayo and Col (2006).

The VPA is calibrated using the Adapt method (Parrack 1986, Gavaris 1988, Conser and Powers 1990).

Status of Gulf of Maine Cod from the 2005 GARM II

Yield and SSB per Recruit-based Reference Points

$$F_{0.1} = 0.15$$

$$F_{\max} = 0.27$$

$$F_{20\%} = 0.36$$

MSY-based Reference Points (NEFSC 2002)

$$\text{MSY} = 16,600 \text{ mt}$$

$$\text{SSB}_{\text{MSY}} = 82,830 \text{ mt}$$

$$F_{\text{MSY}} = 0.23$$

Gulf of Maine cod spawning stock biomass has increased since the late 1990s from 11,100 mt in 1997 to 20,500 mt in 2004, but the stock remains low relative to SSB_{MSY} (82,830 mt).

Fully recruited fishing mortality declined to about 0.35 in 2000 and 2001, but has since increased to 0.58 in 2004, indicating that F continues to remain very high relative to fully recruited F reference points ($F_{0.1} = 0.15$; $F_{\text{msy}} = 0.23$; $F_{\max} = 0.27$).

Thus, the stock remains in an overfished condition and overfishing continues to occur.

Commercial Statistical Areas Used to Define the Stocks of Atlantic Cod

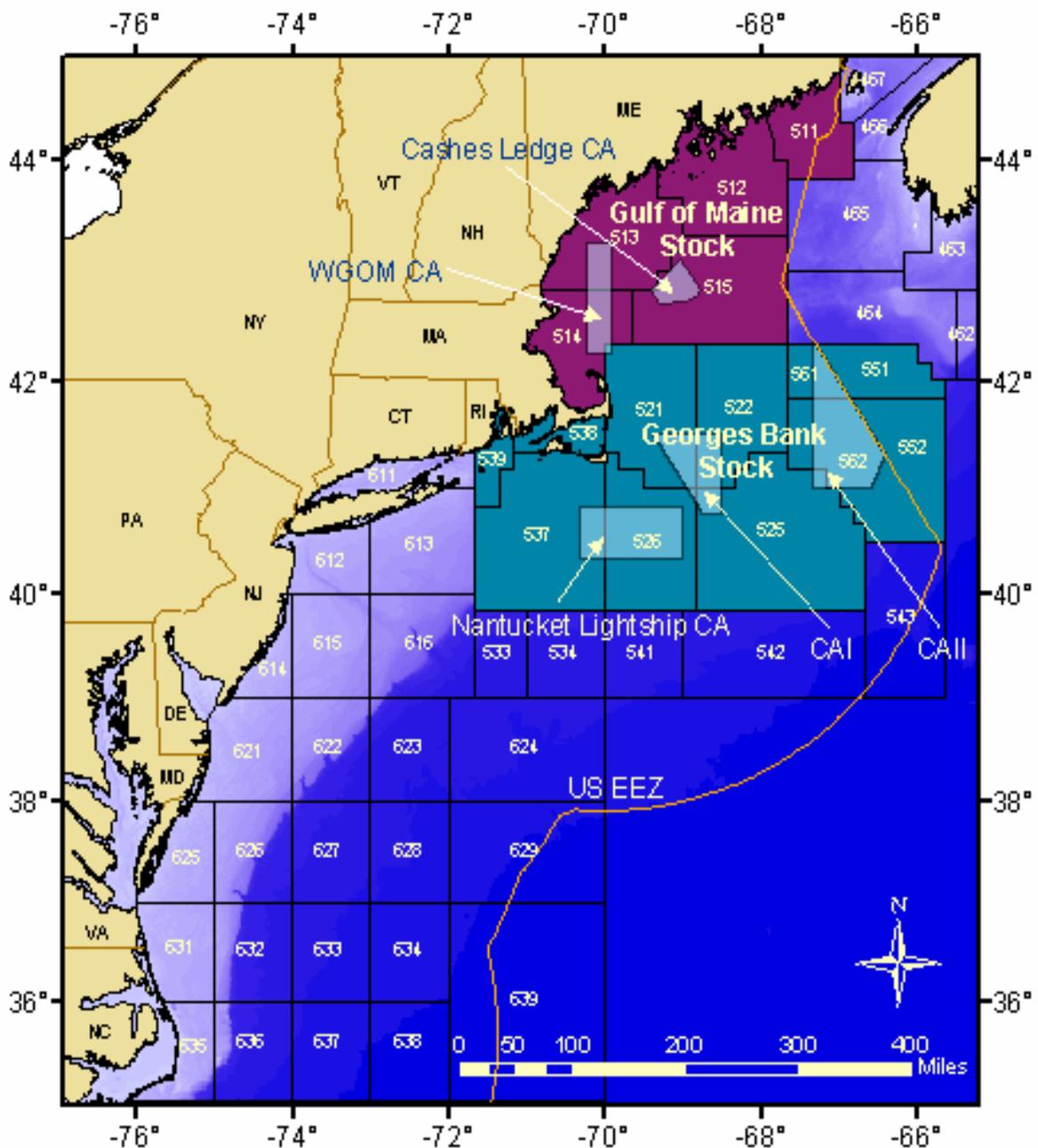
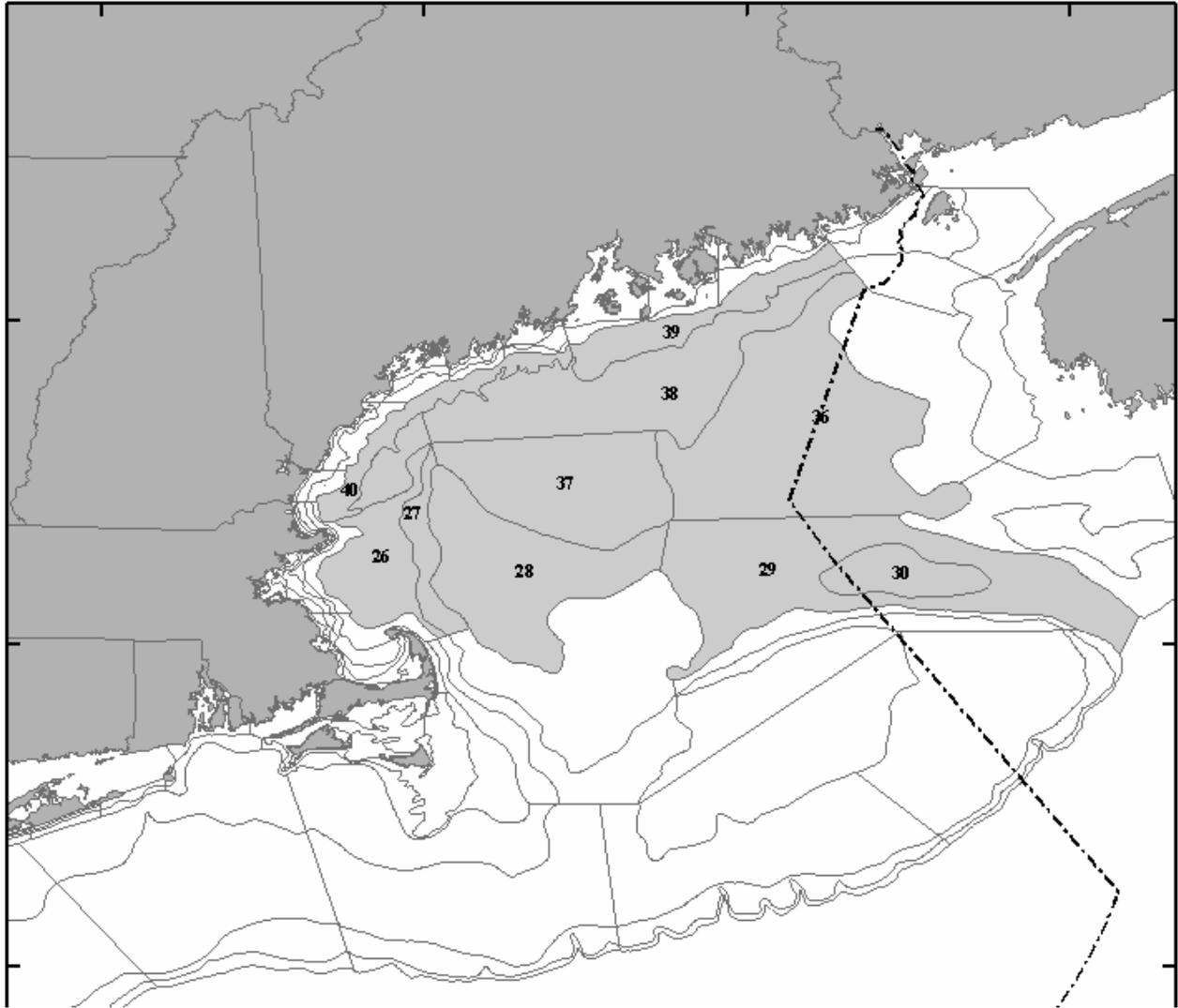


Figure 1.1. Statistical areas used to define the Gulf of Maine and Georges Bank cod stocks.



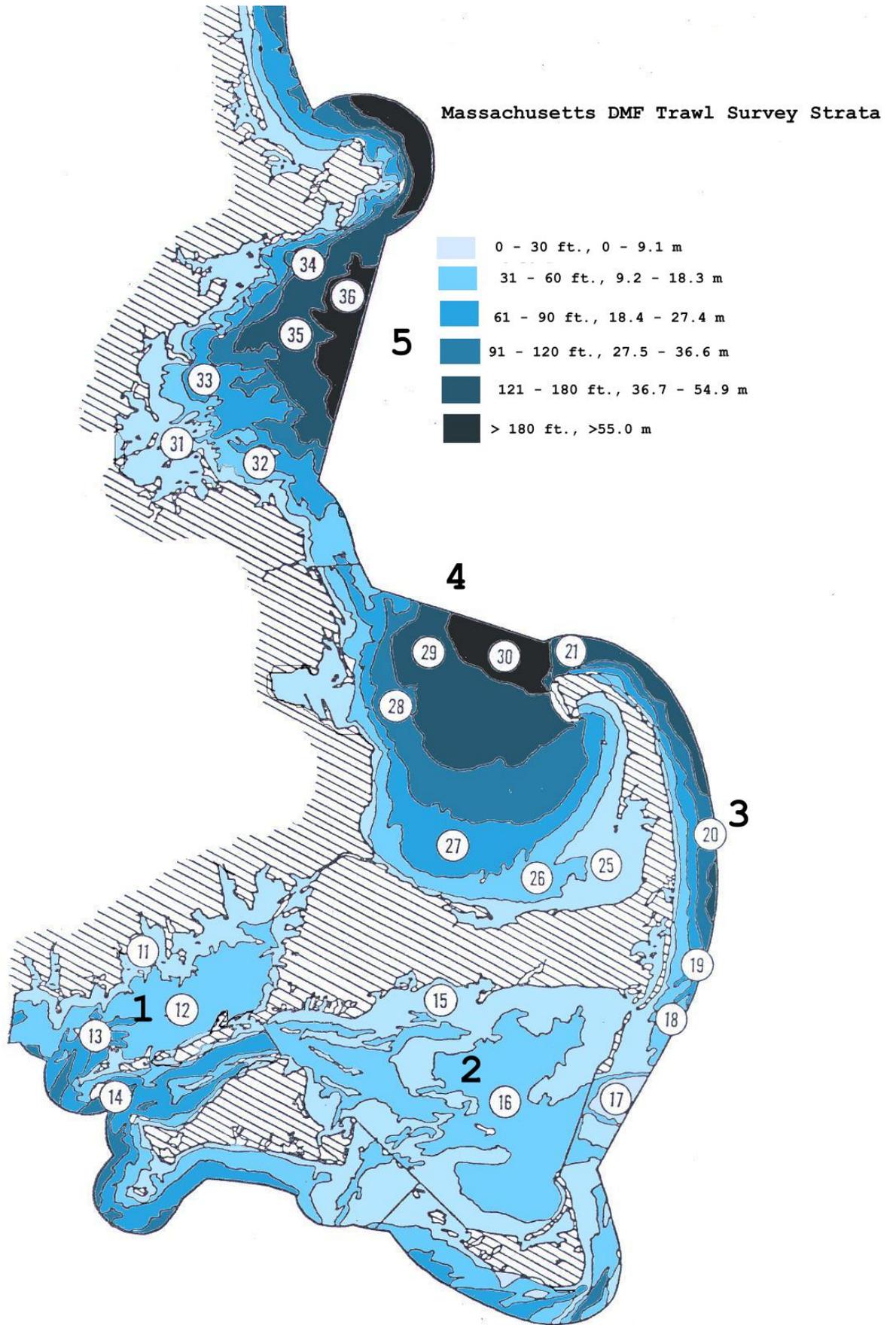


Figure 5. Strata sampled by the Massachusetts DMF inshore bottom trawl survey.

Gulf of Maine Cod Total Commercial Landings

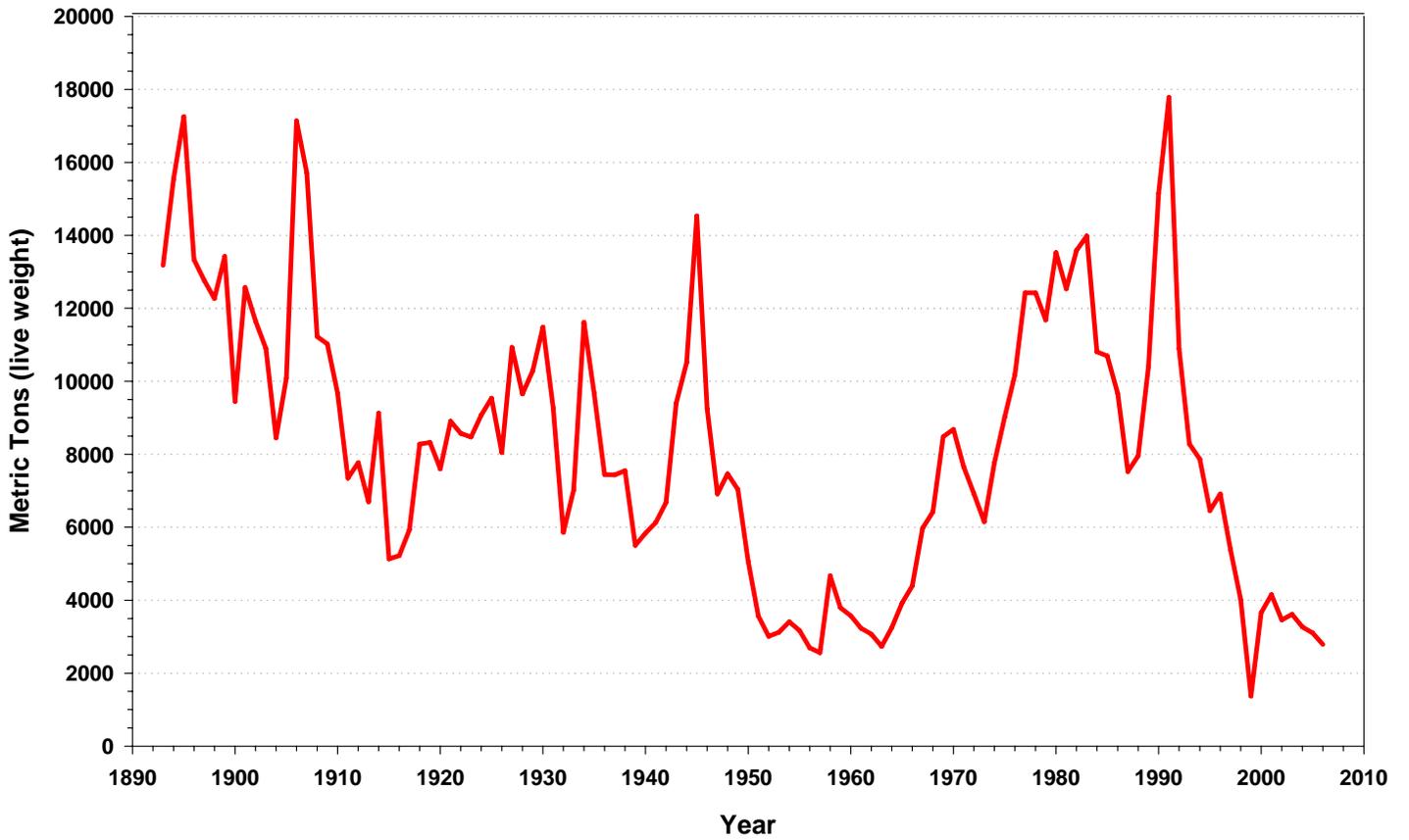


Figure F1. Total commercial landings of Gulf of Maine cod (NAFO Div. 5Y), 1893-2006

Gulf of Maine Cod NEFSC Spring and Autumn Biomass Indices

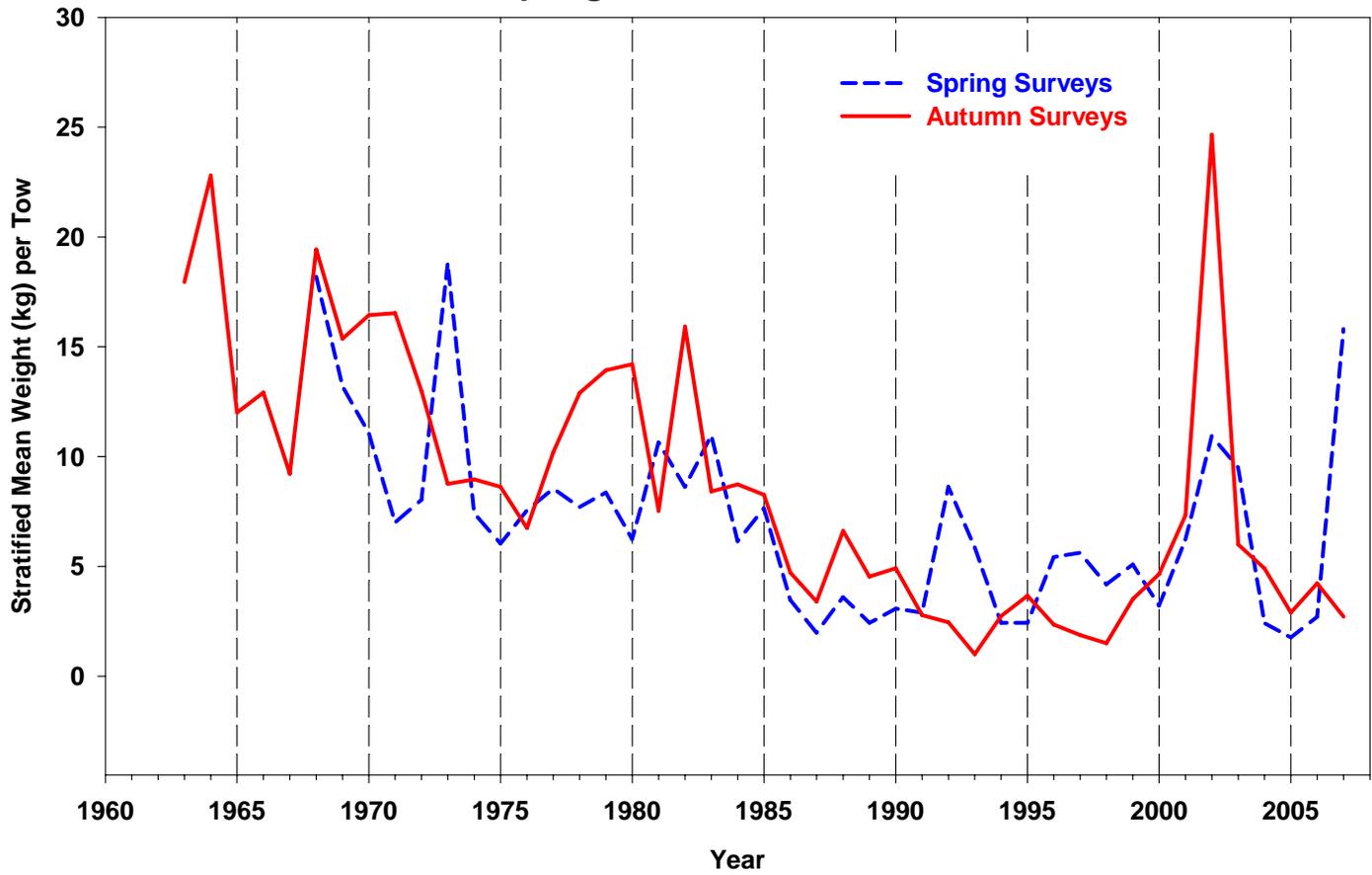
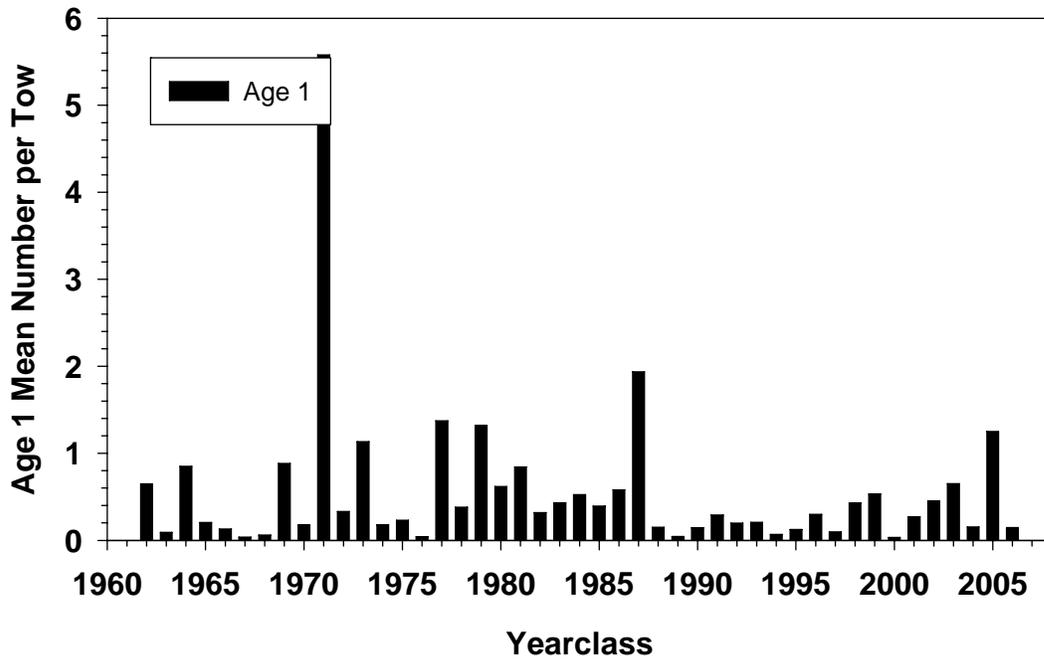


Figure F4. Biomass indices (stratified mean weight per tow) for Gulf of Maine cod from NEFSC autumn bottom trawl surveys.

NEFSC Autumn Survey: Yearclass Strength at Age 1



NEFSC Autumn Survey: Yearclass Strength at Age 2

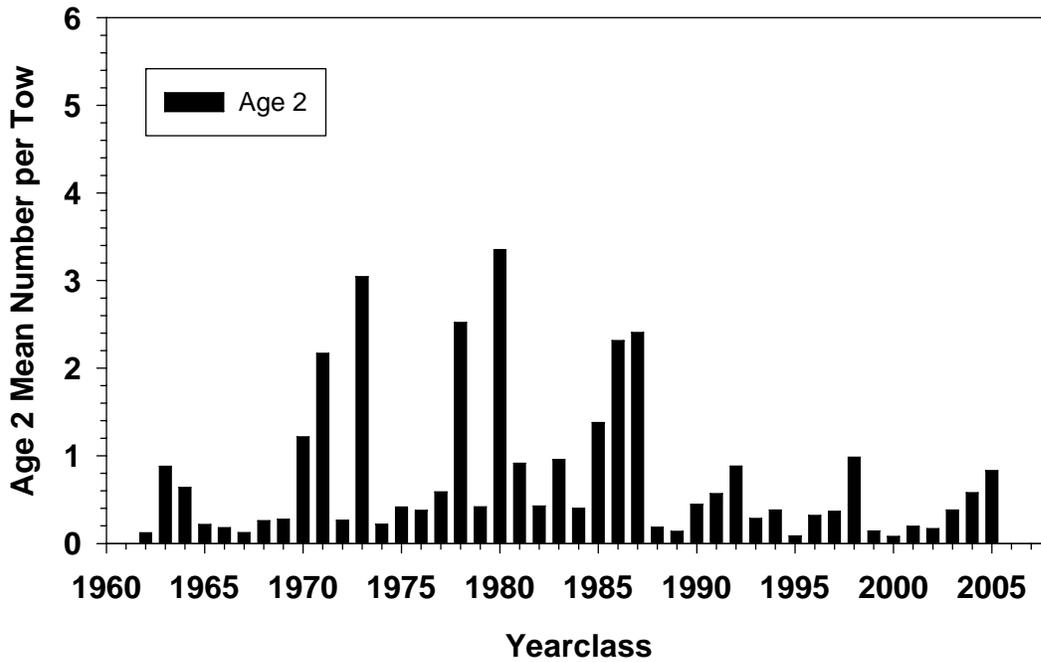
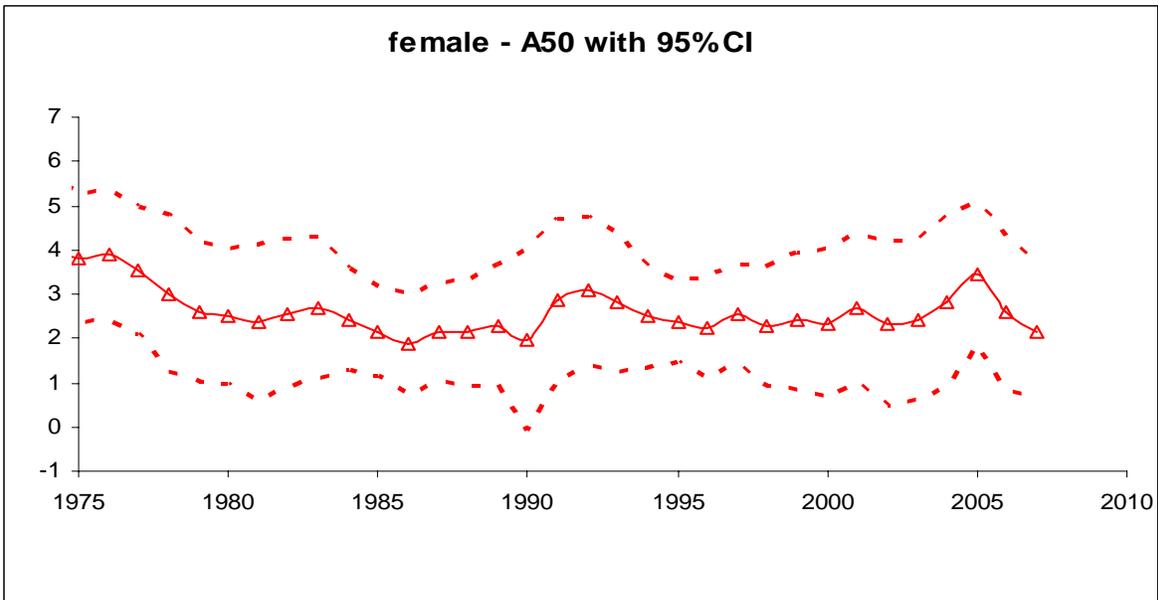
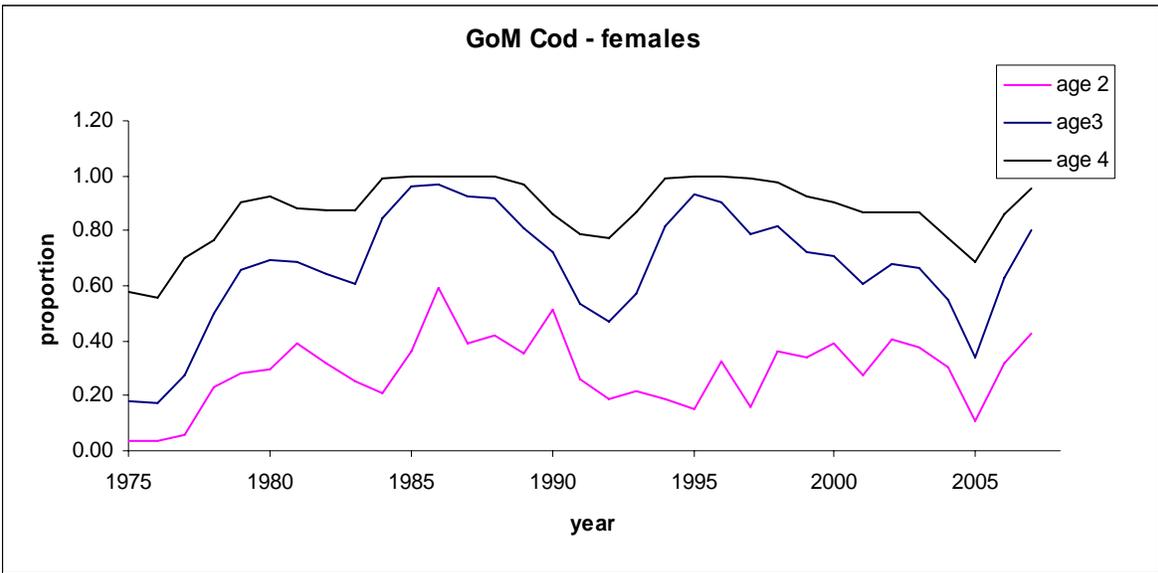
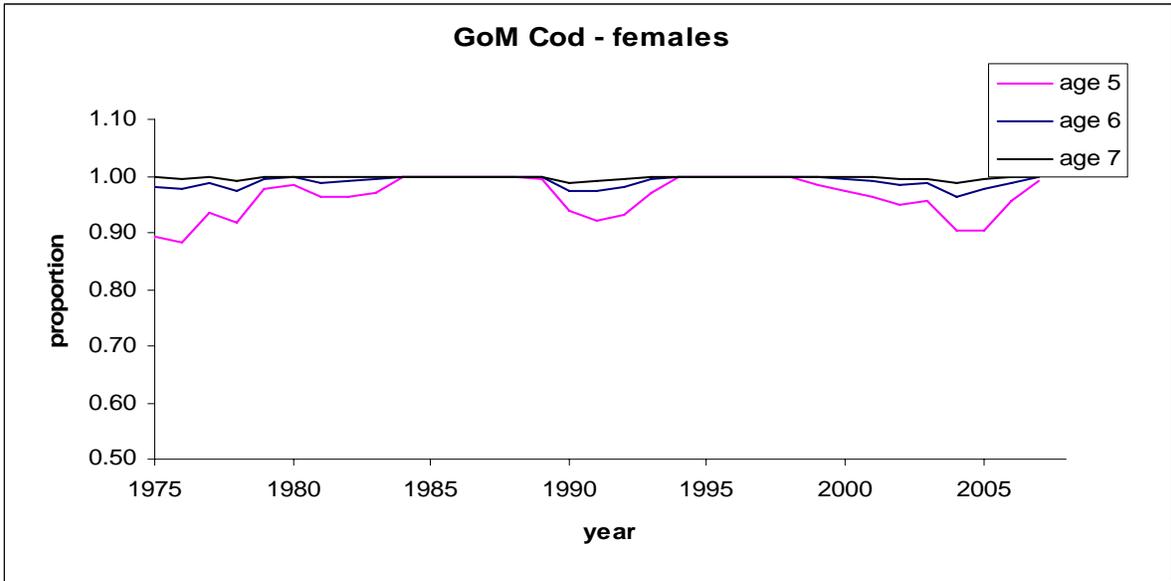
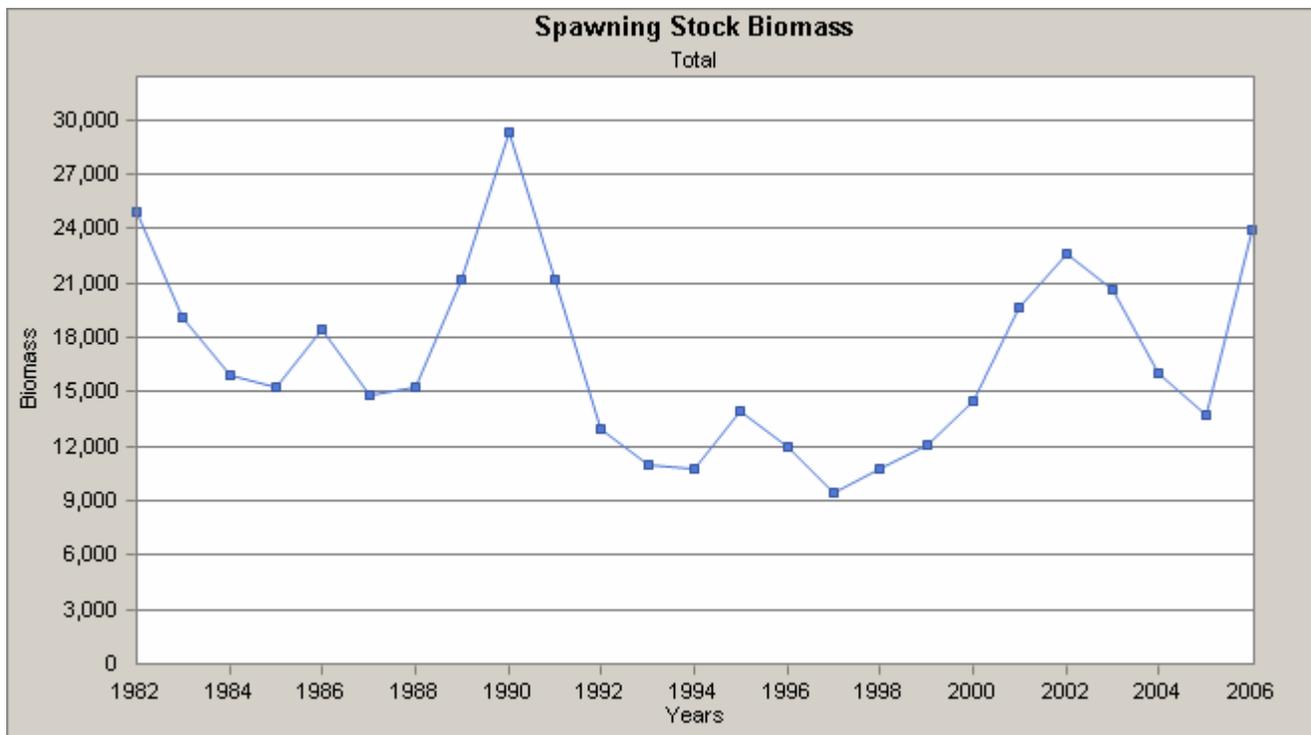
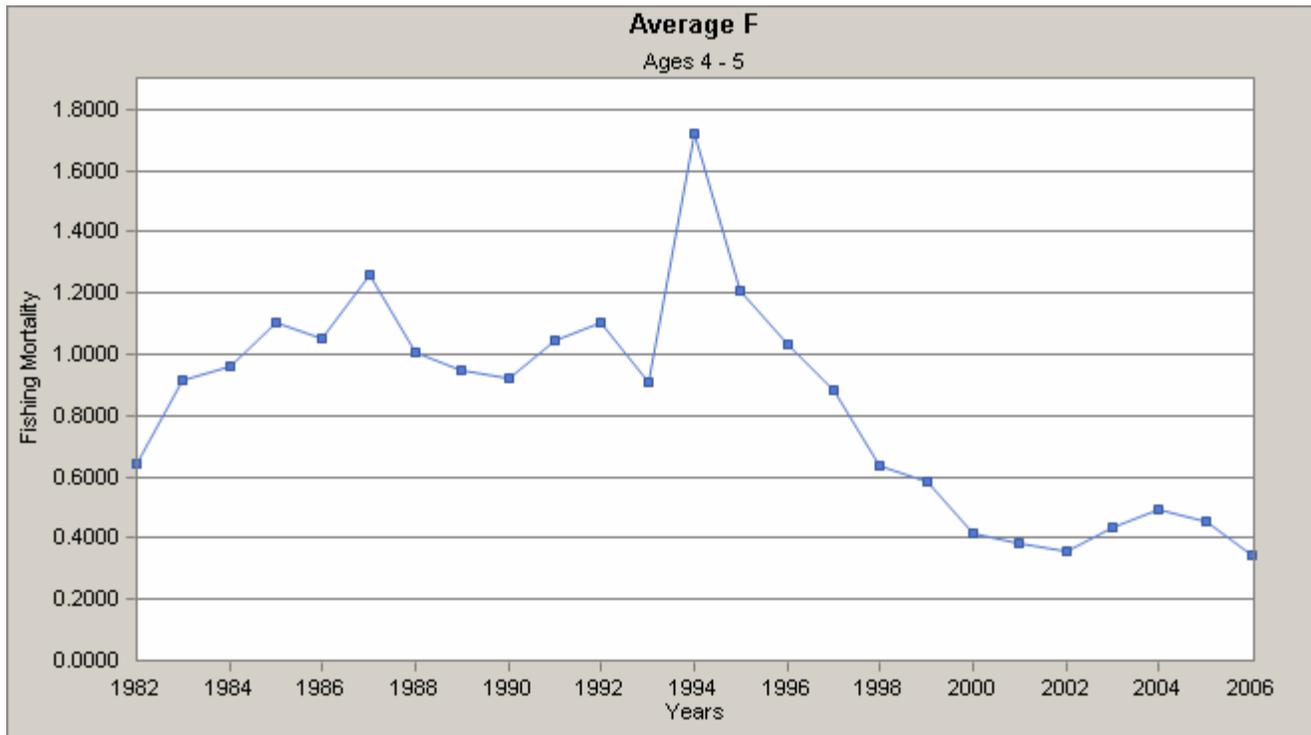


Figure F6. Recruitment indices at age 1 and 2 for Gulf of Maine cod from NEFSC autumn bottom trawl surveys.

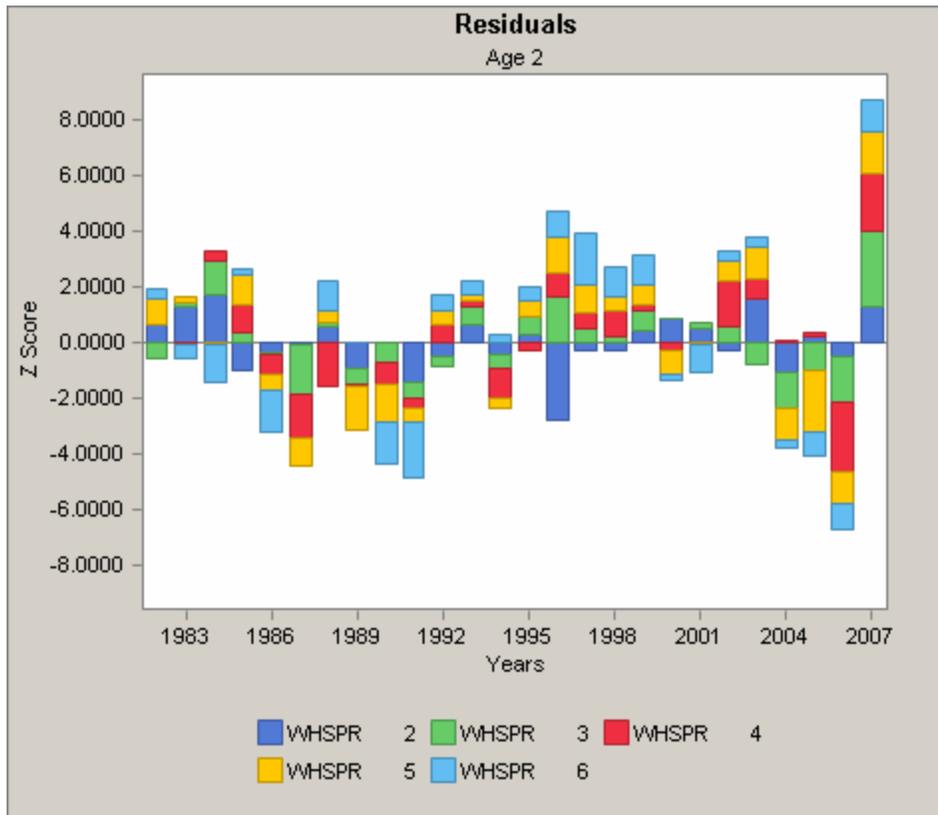


Assessment Results

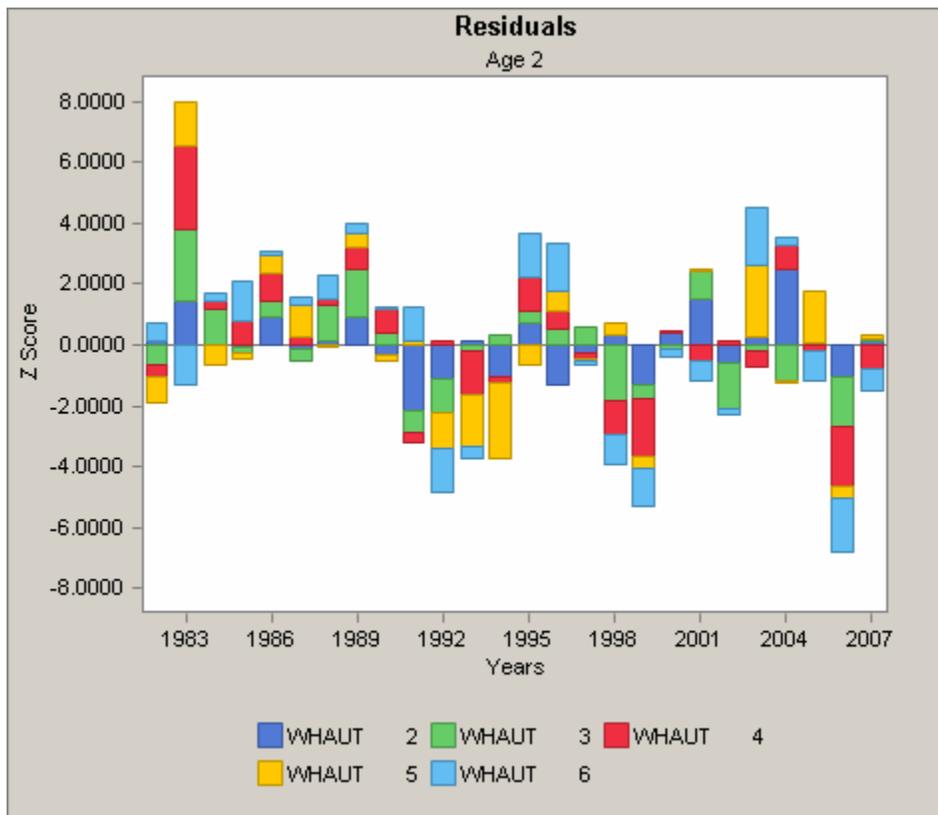
Trends in Average Fully Recruited F (Ages 4-5) and SSB



Residual Pattern from NEFSC Surveys

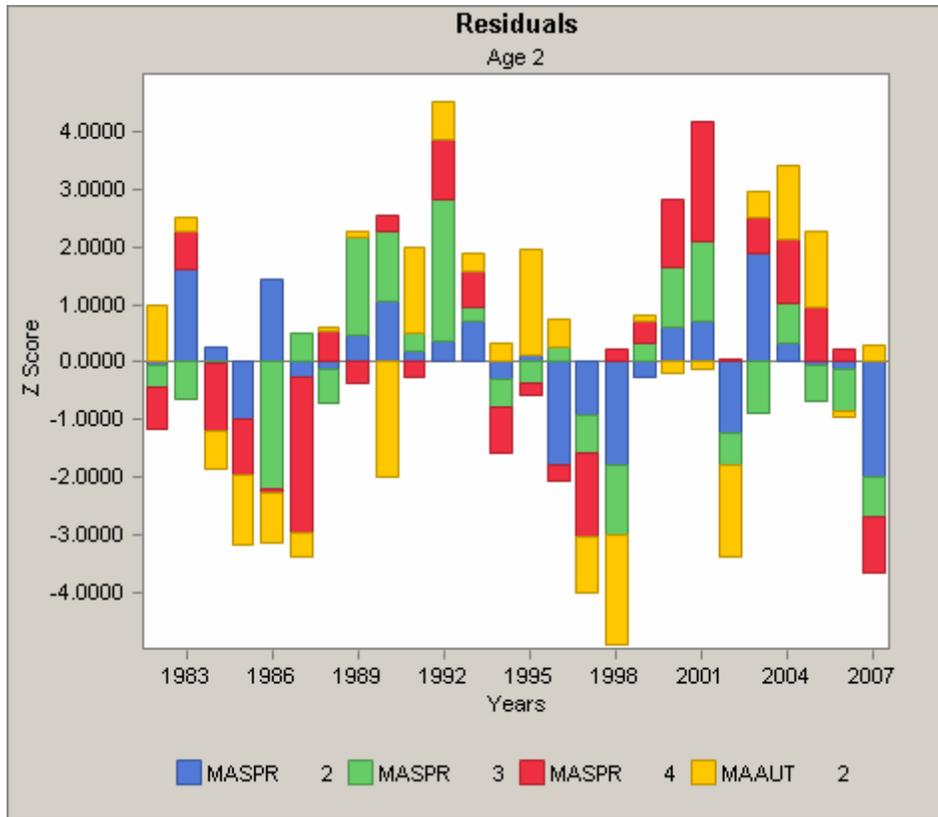


Spring
Surveys



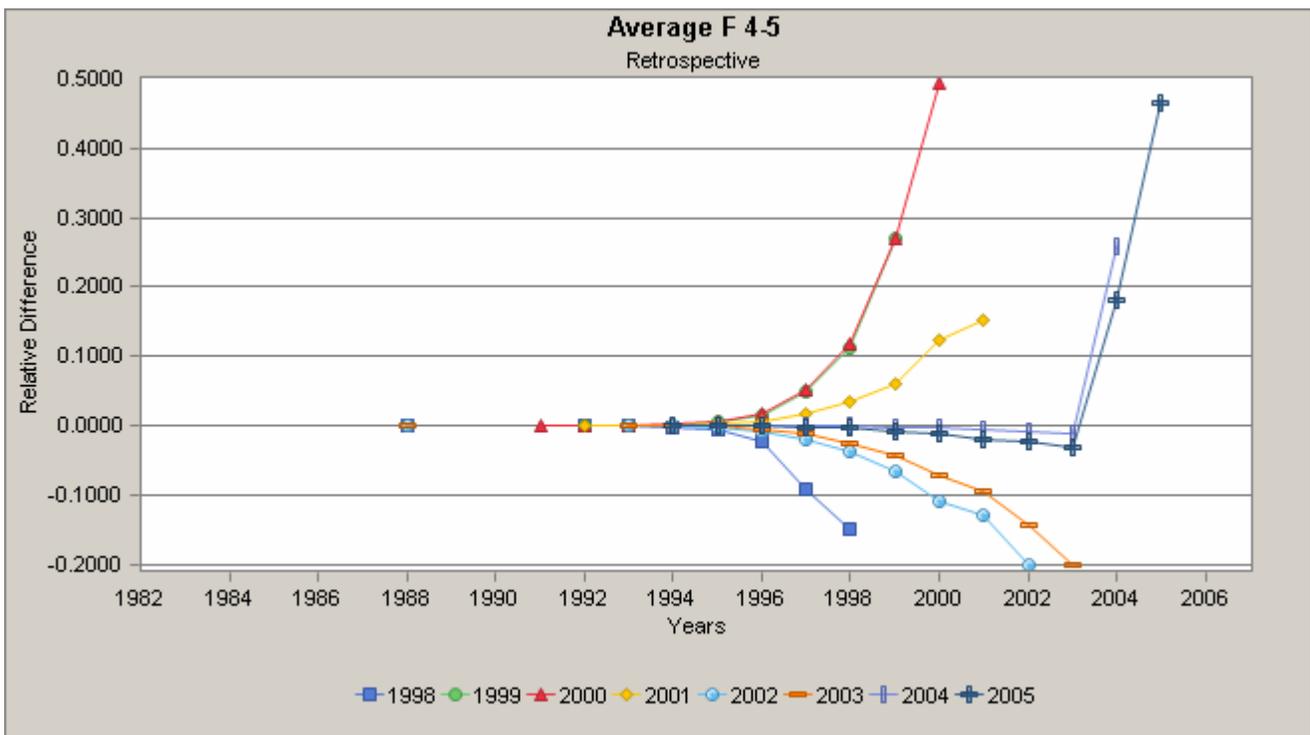
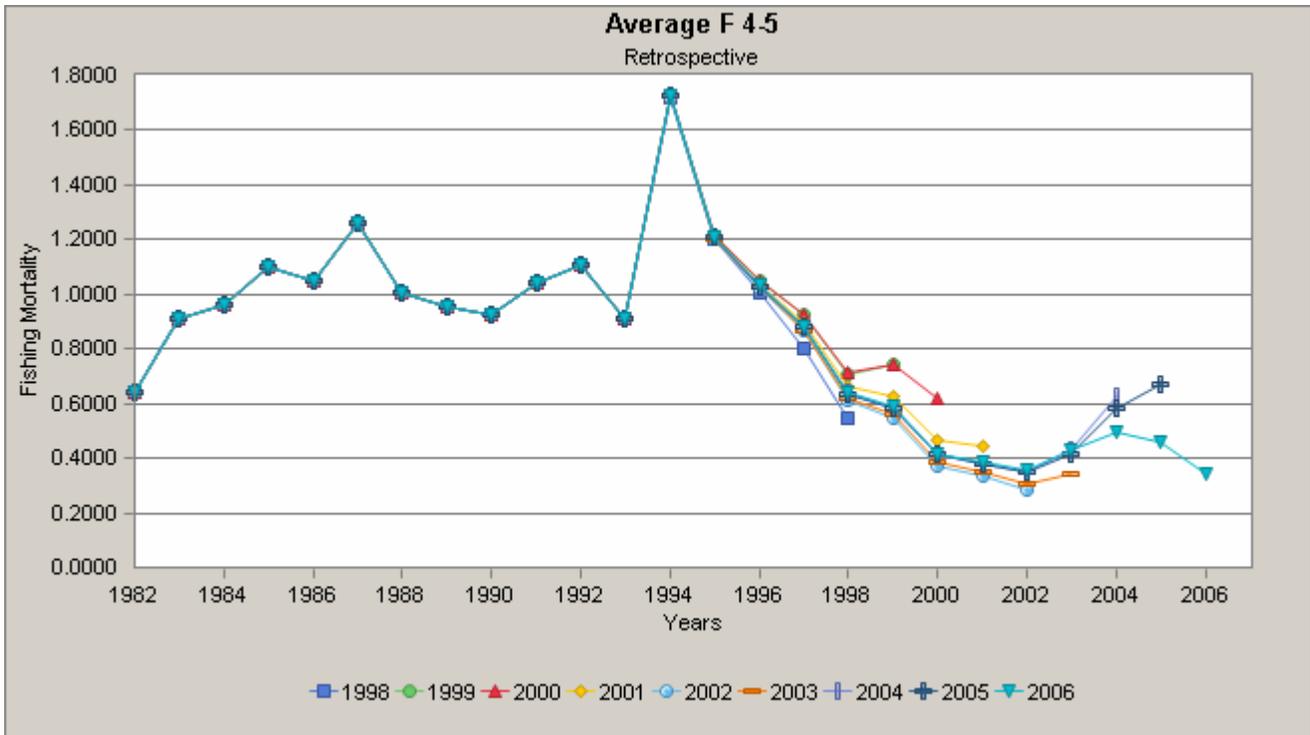
Autumn
Surveys

Residual Patterns from MADMF Surveys



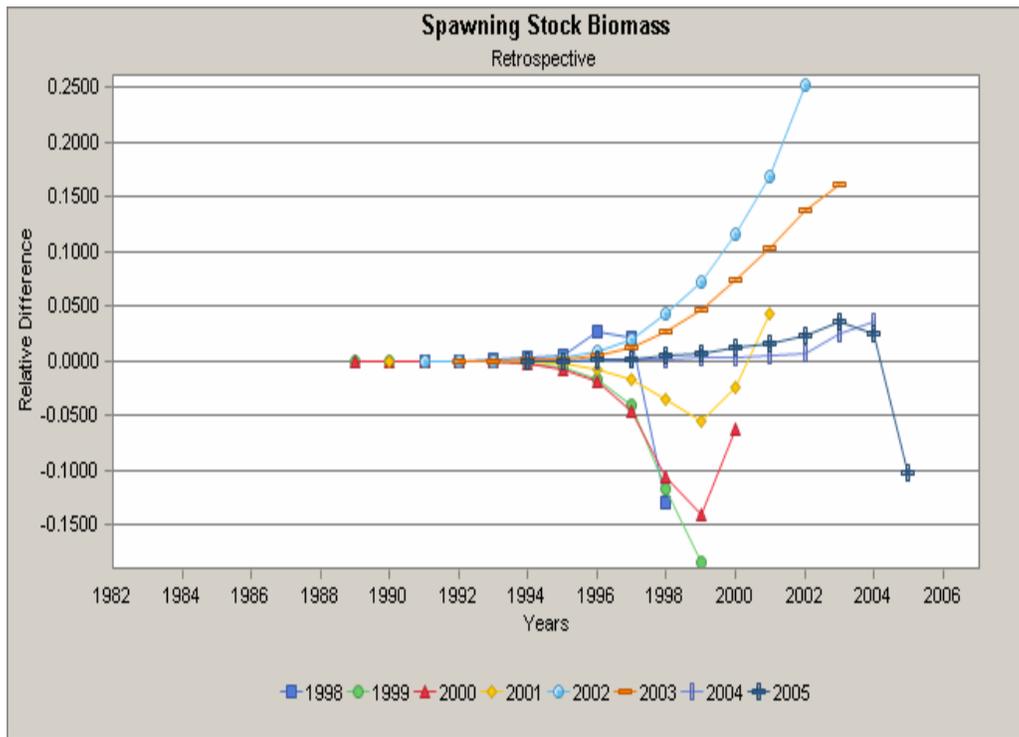
Spring and
Autumn
Surveys

Retrospective Analysis of Fully Recruited F (Ages 4-5)

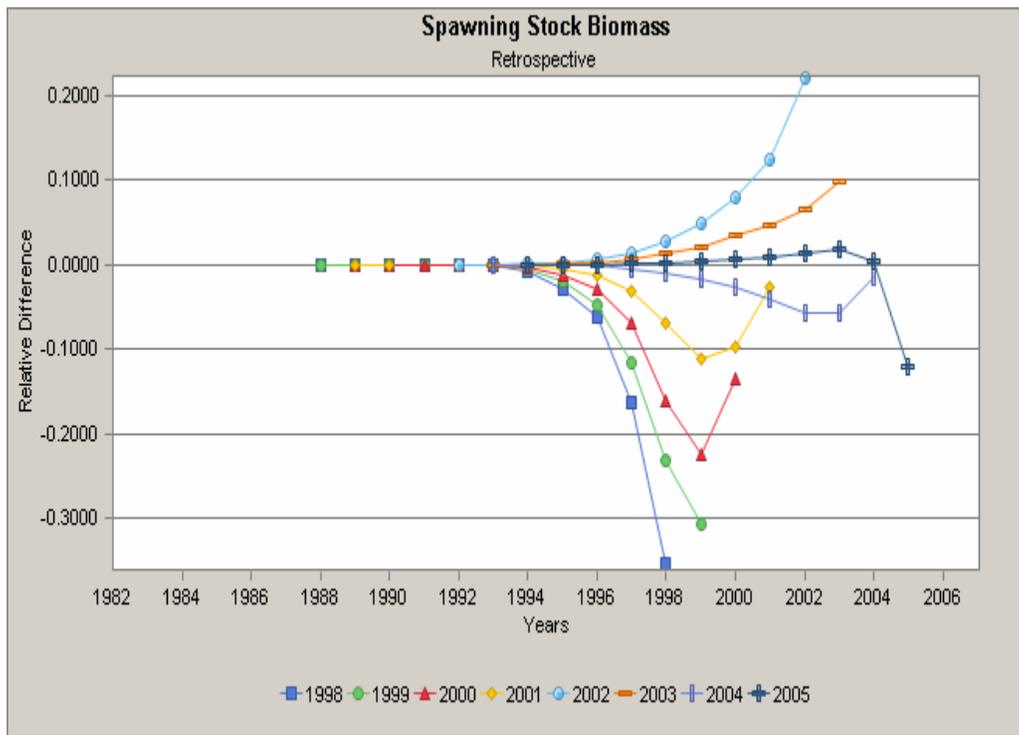


A Digression: Split Survey Series

GoM Cod Retrospective Analysis – Combined Series

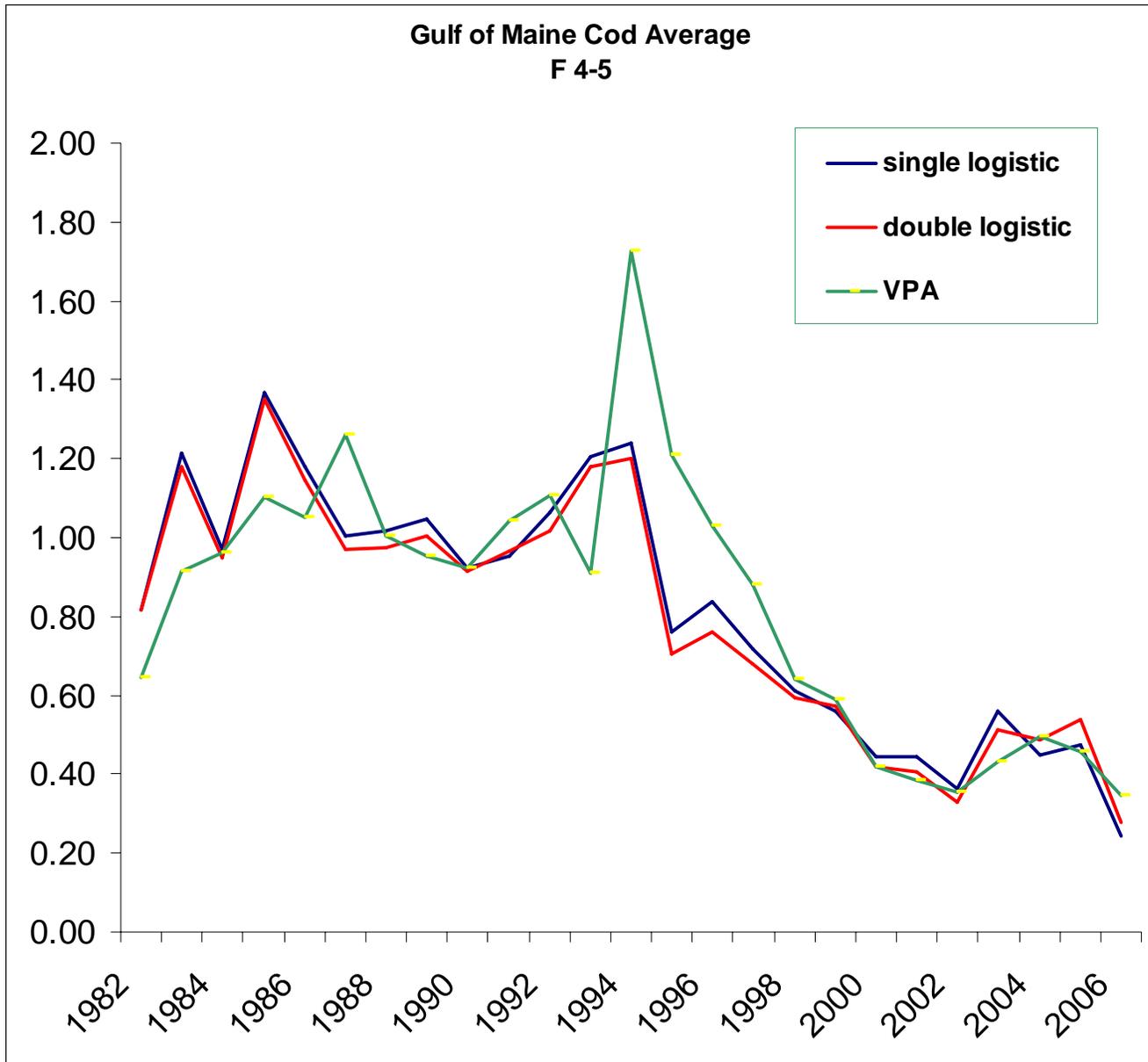


GoM Cod Retrospective Analysis – Split Series

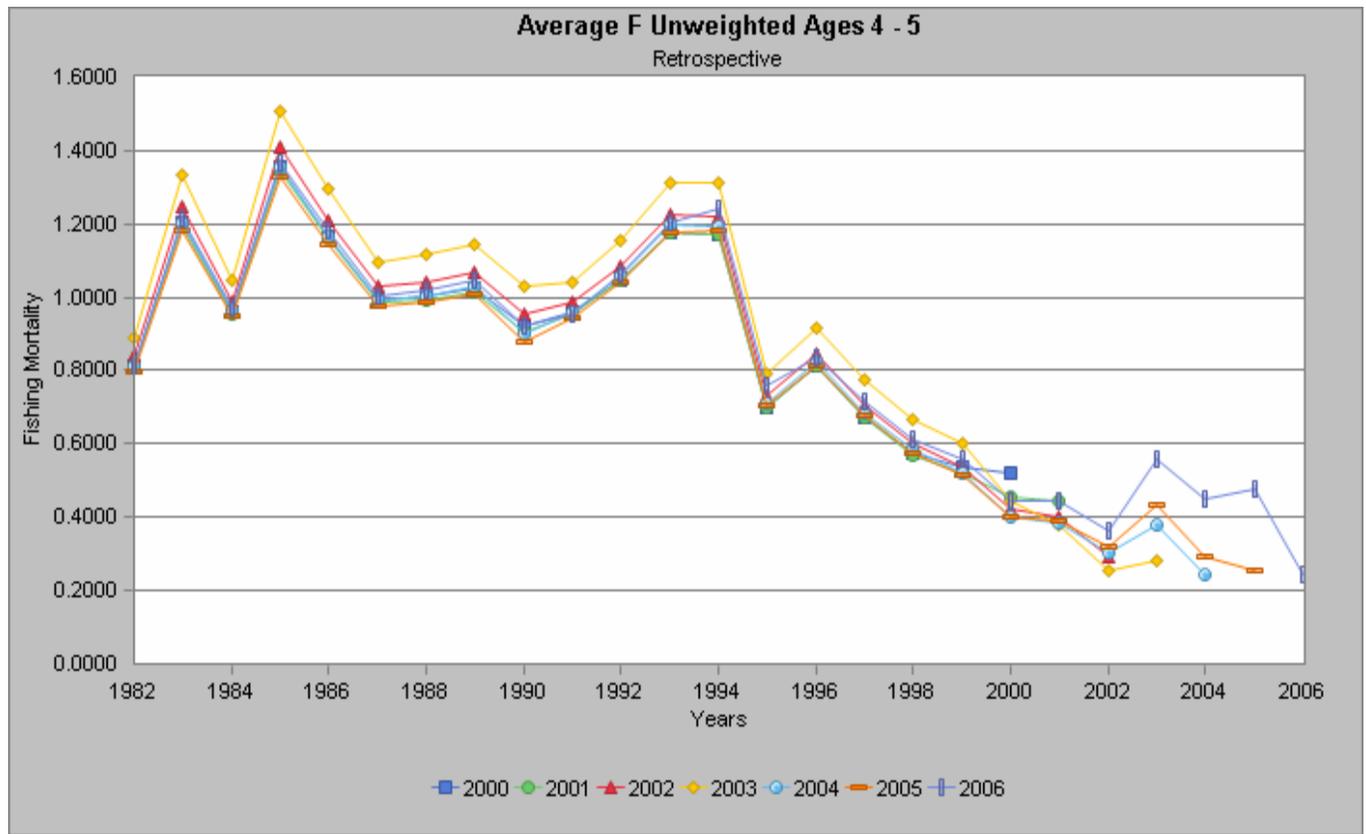


[Back to the Main Feature](#)

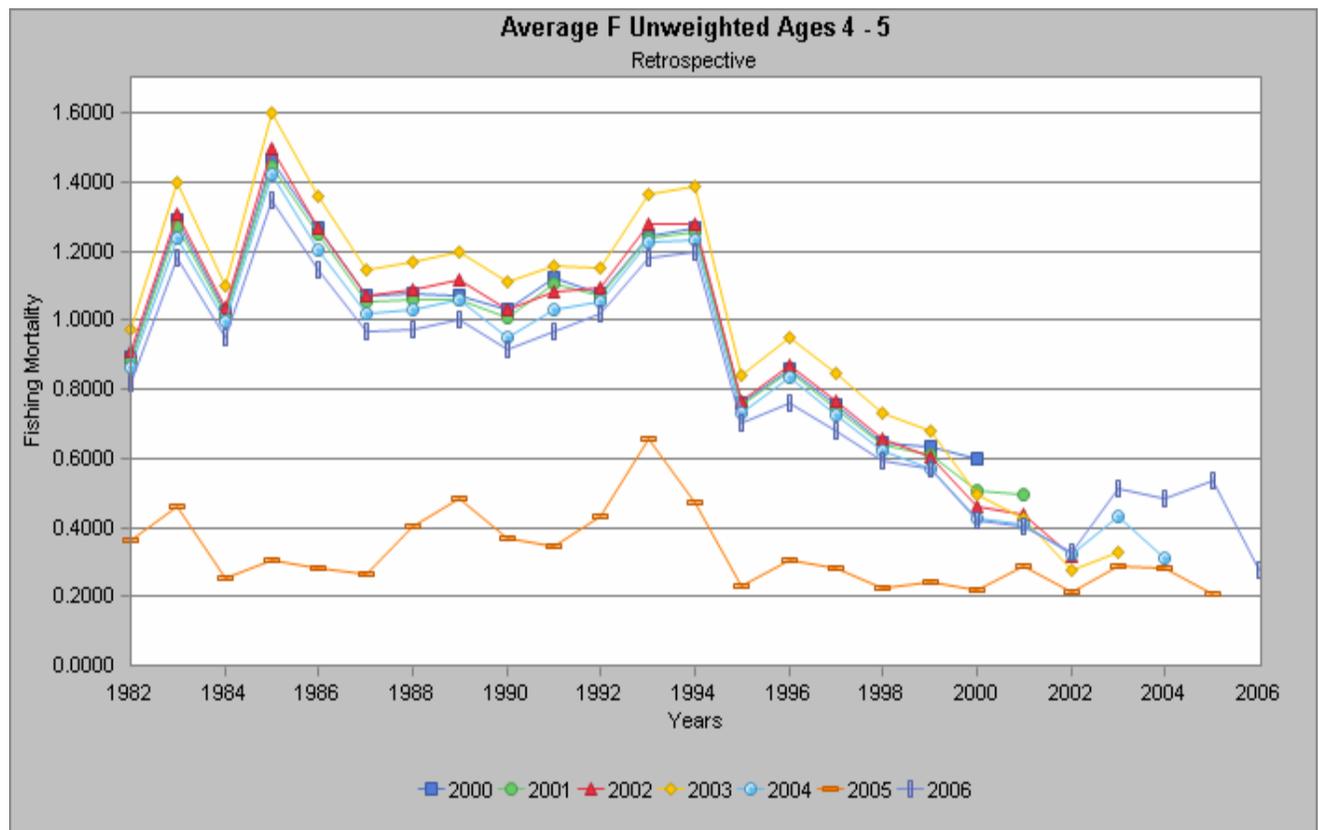
Comparison between ASAP and VPA Results Average F on Ages 4-5



ASAP Retrospective Pattern – Avg F (Ages 4-5) Single Logistic



ASAP Retrospective Pattern – Avg F (Ages 4-5) Double Logistic



Reference Point Calculations

2 Scenarios

1. Parametric Approach

Fit a stock Recruitment Relationship using estimates of SSB and Recruits from VPA

Incorporate recent (2002-2006) PR, average weights and maturity schedule

Use resulting estimates of F_{msy} , alpha, beta and sigma in a long-term projection of SSB and Catch

2. Non-parametric Approach

Perform an SSB per Recruit analysis

Incorporate recent (2002-2006) PR, average weights and maturity schedule

Use resulting the estimate of F_{msy} proxy ($F_{40\% \text{ MSP}}$) and the cumulative distribution function of age 1 recruits from the 1981 to 2004 year classes in a long-term projection of SSB and Catch

1. Parametric Results

From the fit of the Beverton-Holt Stock Recruit Function

$F_{msy} = 0.28$

$B_{msy} = 60,304 \text{ mt}$

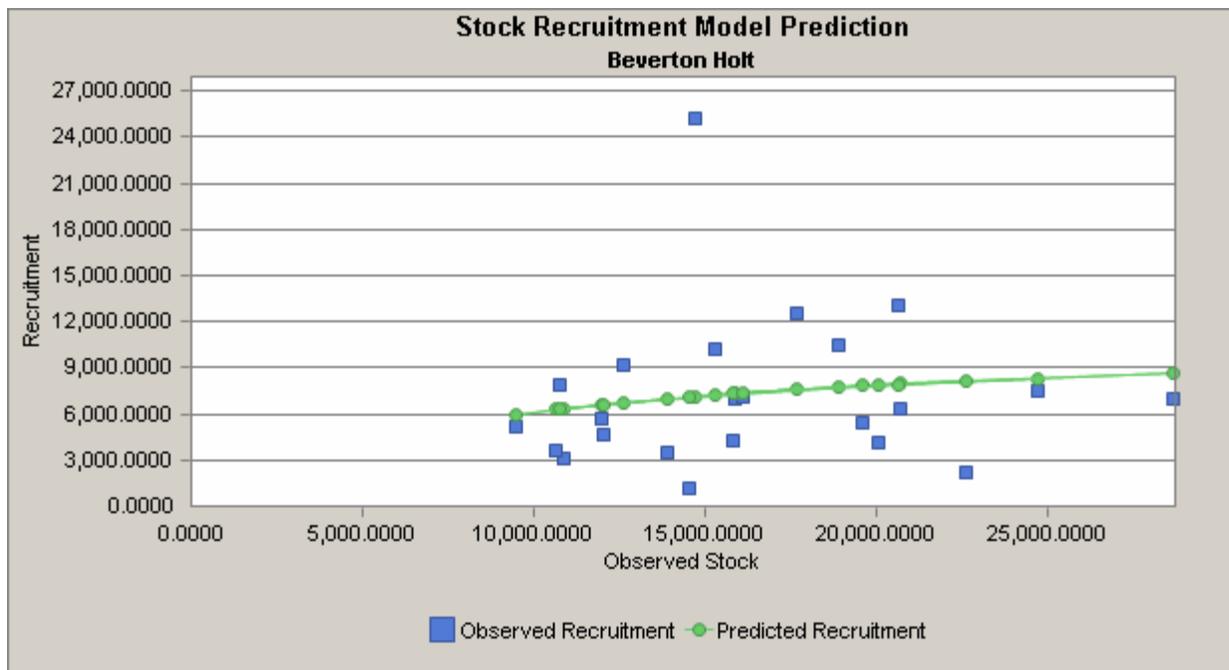
$MSY = 15,691 \text{ mt}$

$\text{Alpha} = 10,982.3$

$\text{Beta} = 7,879.1$

$\text{Sigma} = 0.626$

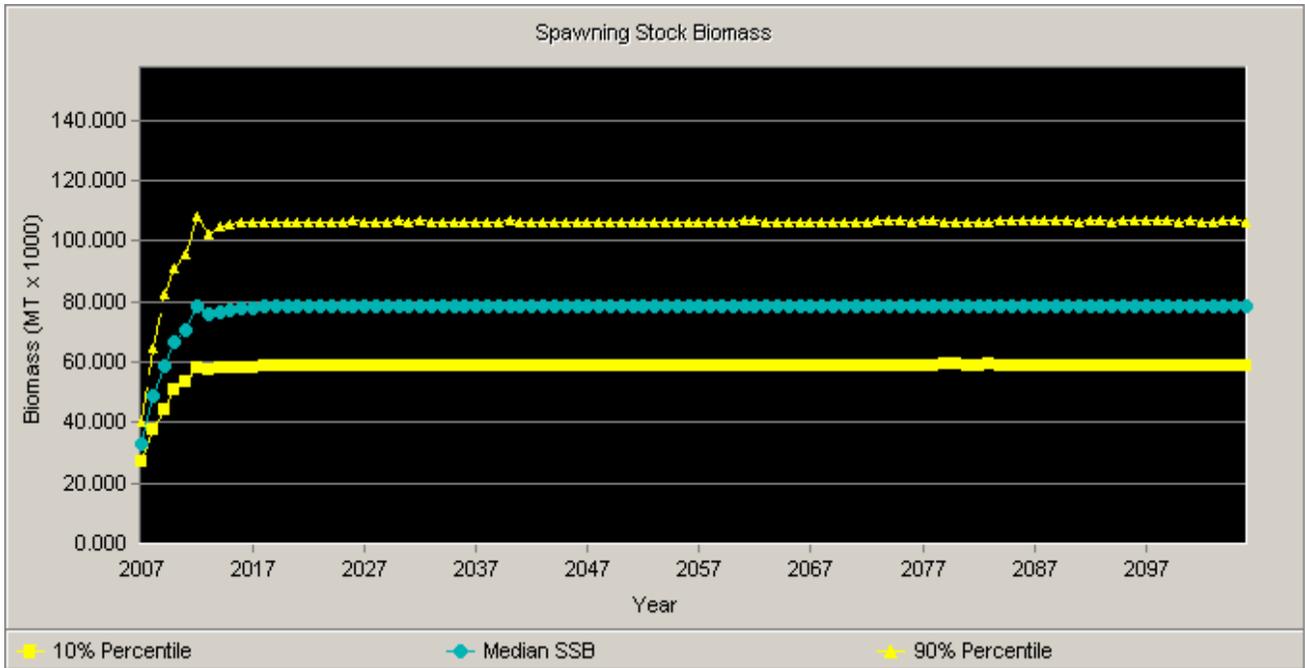
$\text{Steepness} = 0.867$



AGEPRO Projection – Parametric Approach

$F_{msy} = 0.28$

$SSB_{msy} = 78,413 \text{ mt}$

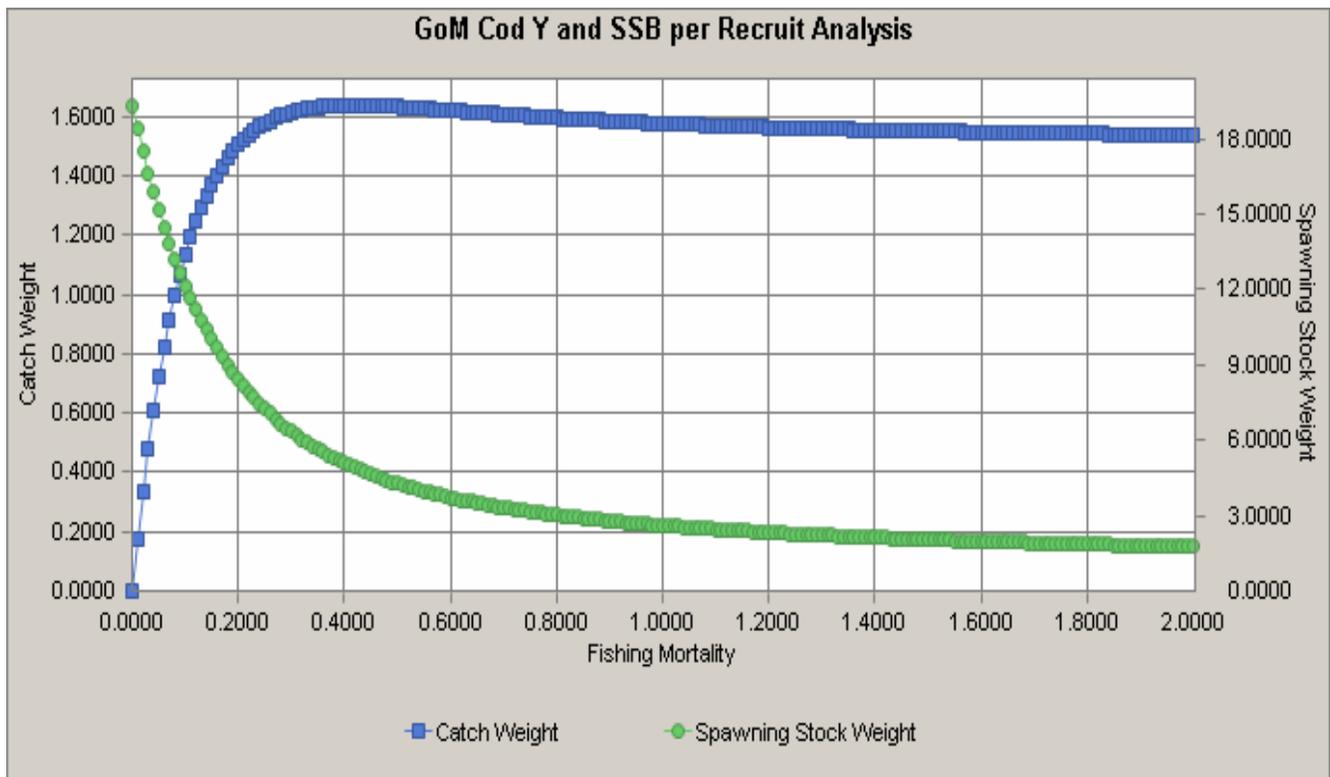


$MSY = 18,886 \text{ mt}$



2. Non-parametric Results

Yield and SSB per Recruit Analysis



$F_{40\%} = 0.23$

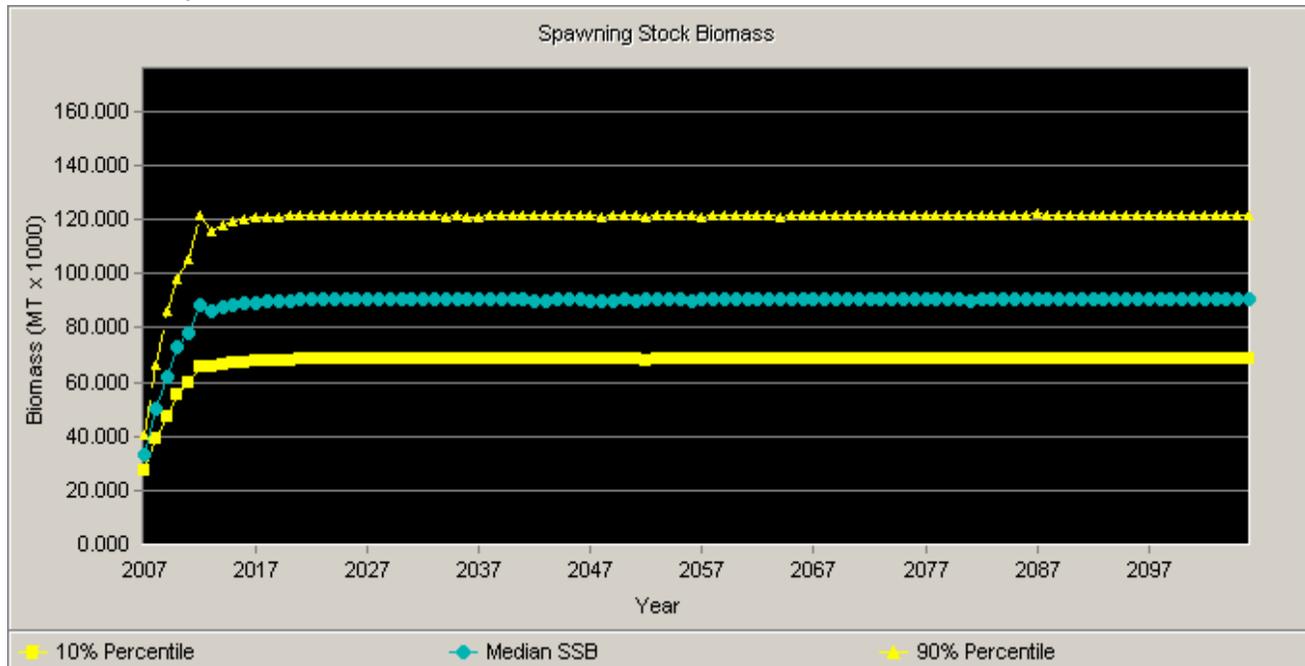
$SSB_{msy} = 51,408 \text{ mt}$

$MSY = 10,294 \text{ mt}$

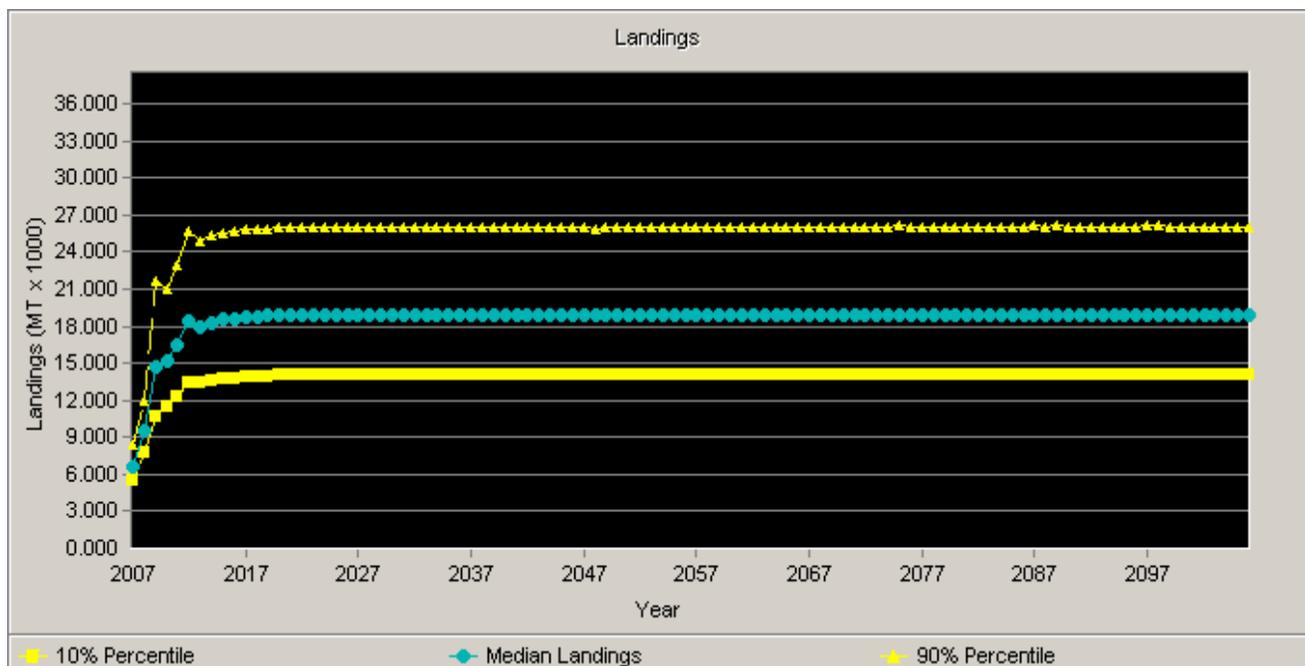
AGEPRO Projection – Non parametric Approach

$F_{msy} = F_{40\%} = 0.23$

$SSB_{msy} = 90,278 \text{ mt}$



$MSY = 19,673 \text{ mt}$



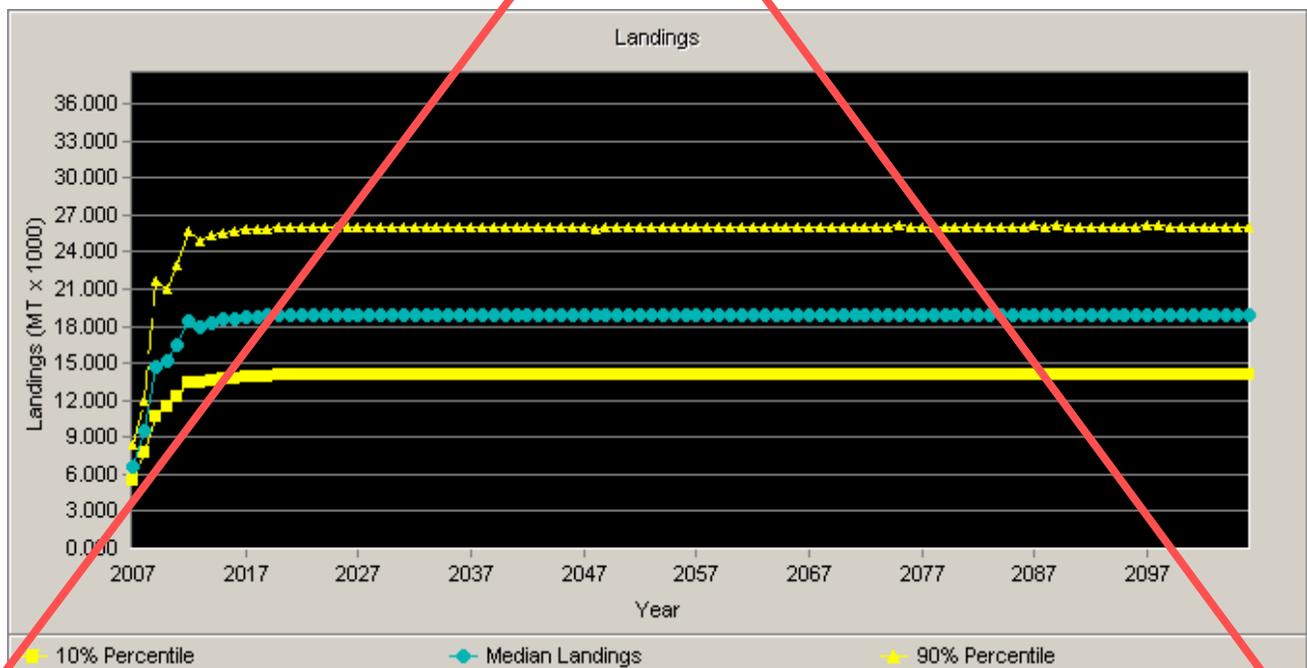
AGEPRO Projection – Non parametric Approach

$F_{msy} = F_{40\%} = 0.23$

$SSB_{msy} = 90,278 \text{ mt}$



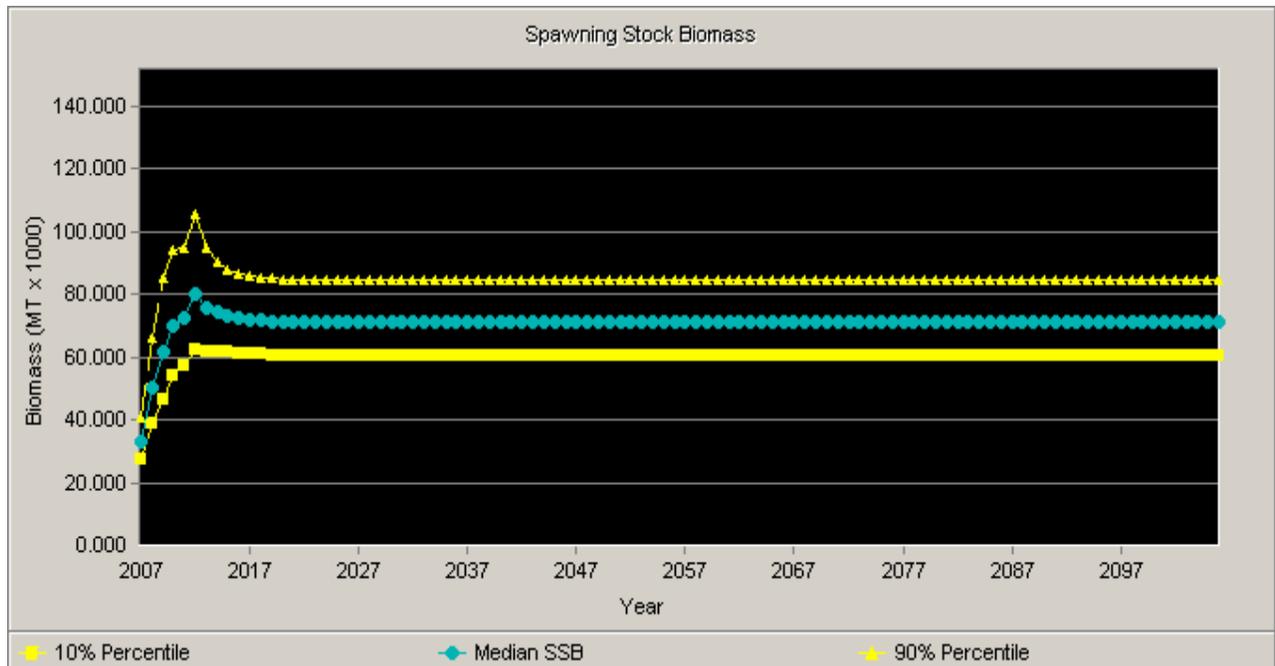
$MSY = 19,673 \text{ mt}$



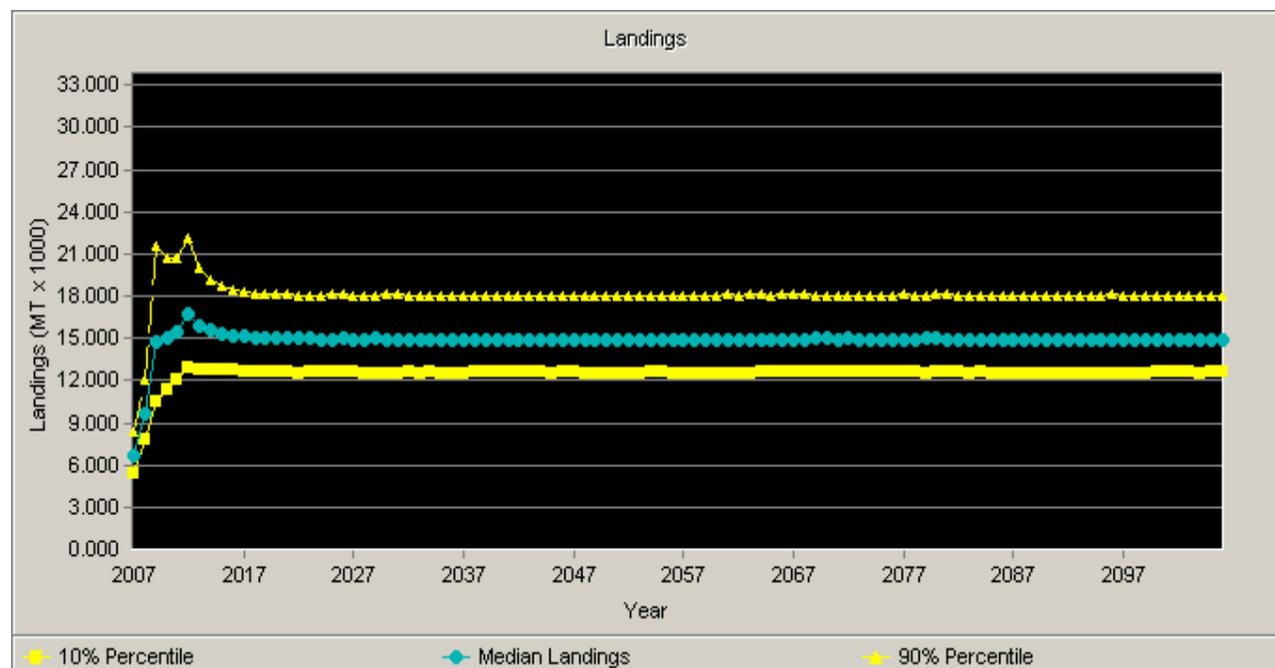
AGEPRO Projection – Non parametric Approach

$F_{msy} = F_{40\%} = 0.23$

$SSB_{msy} = 71,150 \text{ mt}$



$MSY = 14,936 \text{ mt}$



Summary

MSY-based Reference Points (NEFSC 2002)

MSY = 16,600 mt
SSBMSY = 82,830 mt
FMSY = 0.23

Revised Reference Points (This meeting)

	Projections			
	BH	Y&SSB/R	Non Par	Par
MSY	15,691	10,294	14,936	19,673
SSBmsy	60,304	51,408	71,150	78,413
Fmsy	0.28	0.23		