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Surplus Production of Georges Bank Yellowtail Flounder Estimated from 2013 VPA Model Results

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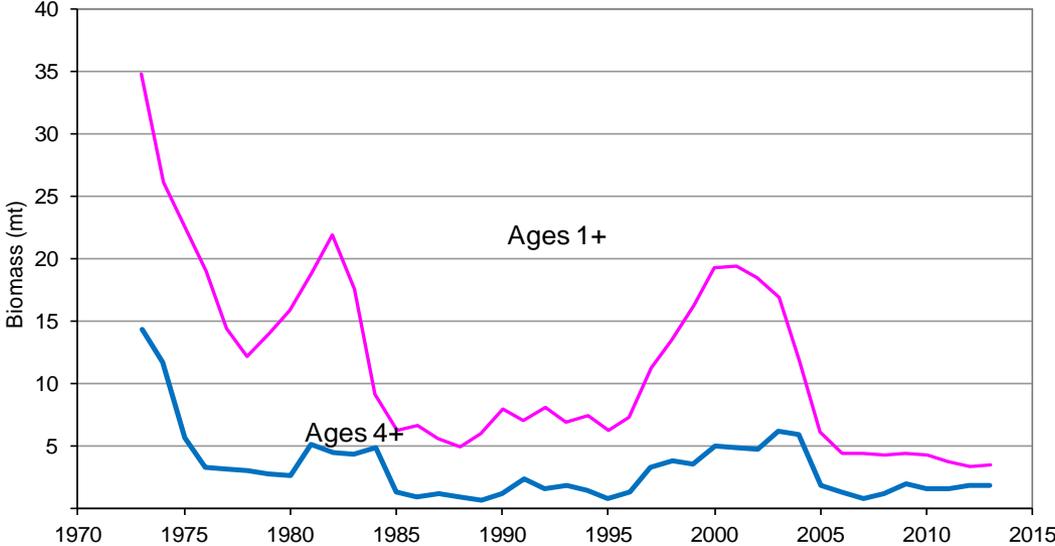
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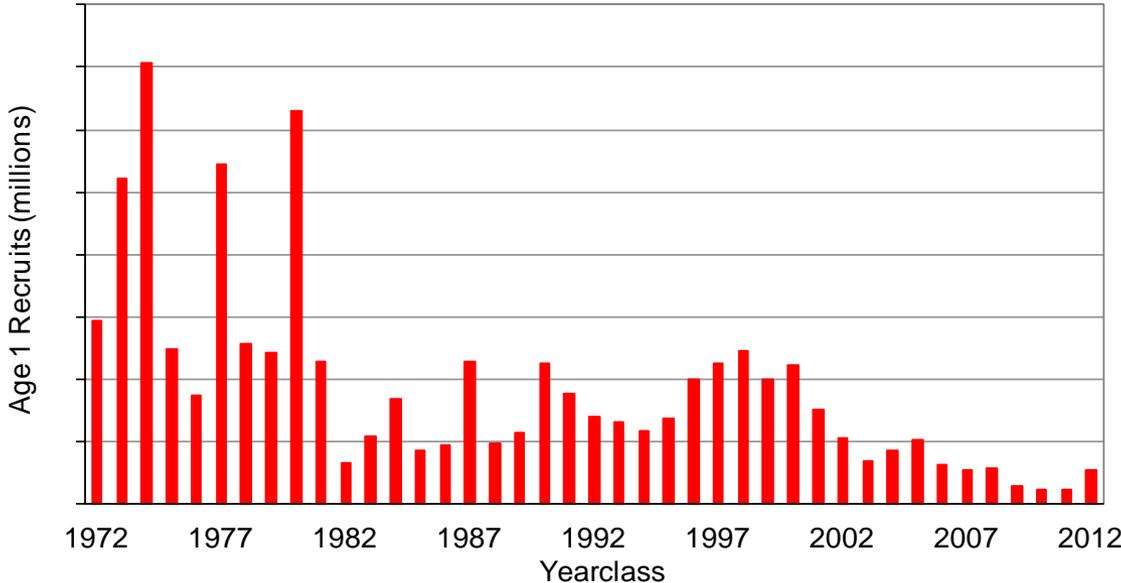
Introduction

- Surplus production defined as
$$SP = (\text{Yield} + \text{recruitment} + \text{growth}) - \text{natural mortality}$$
- Estimate trends in SP for GB YT during 1973-2012
- Apply methods of Rivard (1980) using cohort analysis
- Input data from results of the 2013 VPA for YT (Legault 2013)
- Method does not require assumption of 'equilibrium' state ;
Calculations refer to transient state

Biomass and Recruitment Time Series

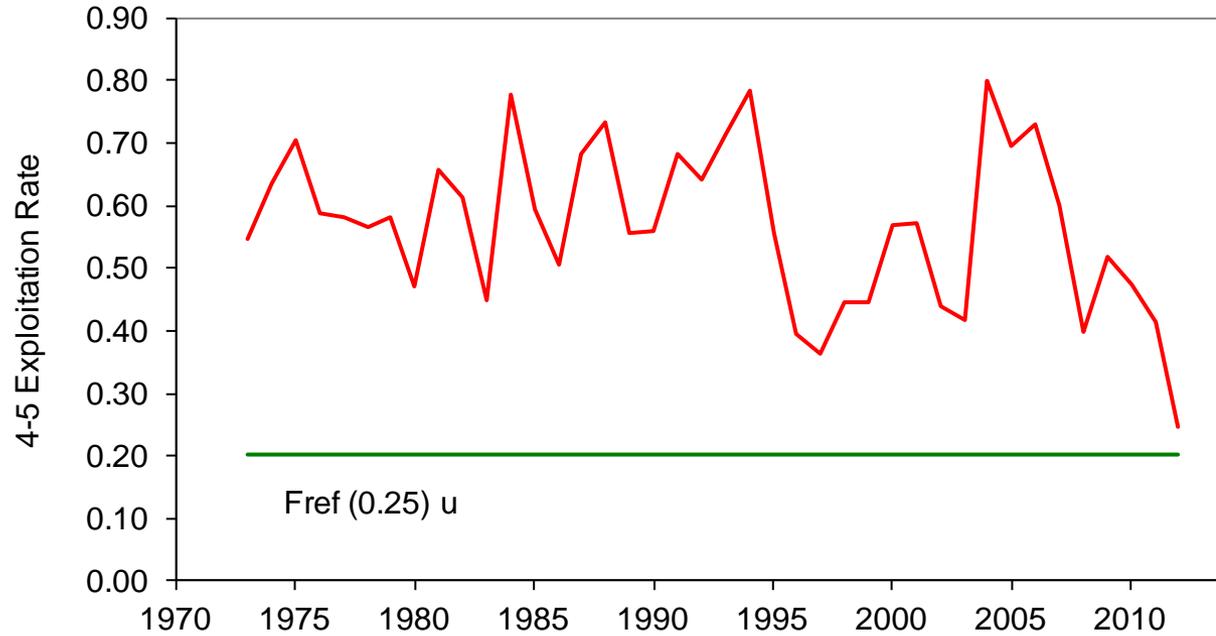


Biomass
age 1+ and age 4+



Recruitment - age 1 fish

Exploitation rate, Ages 4-5 and $F_{ref} = 0.25$



Equations and Calculations

$$\text{Age 2 recruitment} = B_y (\text{age 2})$$

$$\text{delta B} = \text{change in biomass} = [y_{t,a_t} - y_{t-1, a_{t-1}}]$$

$$M(\text{biomass})_y = N_{y,a} * \text{Mean wt}_{y,a} * (M_{y,a}/Z_{y,a}) * (1 - \exp(-Z_{y,a}))$$

$$F(2+ \text{ biomass})_y = \text{Yield} = N_{y,a} * \text{Mean wt}_{y,a} * (F_{y,a}/Z_{y,a}) * (1 - \exp(-Z_{y,a}))$$

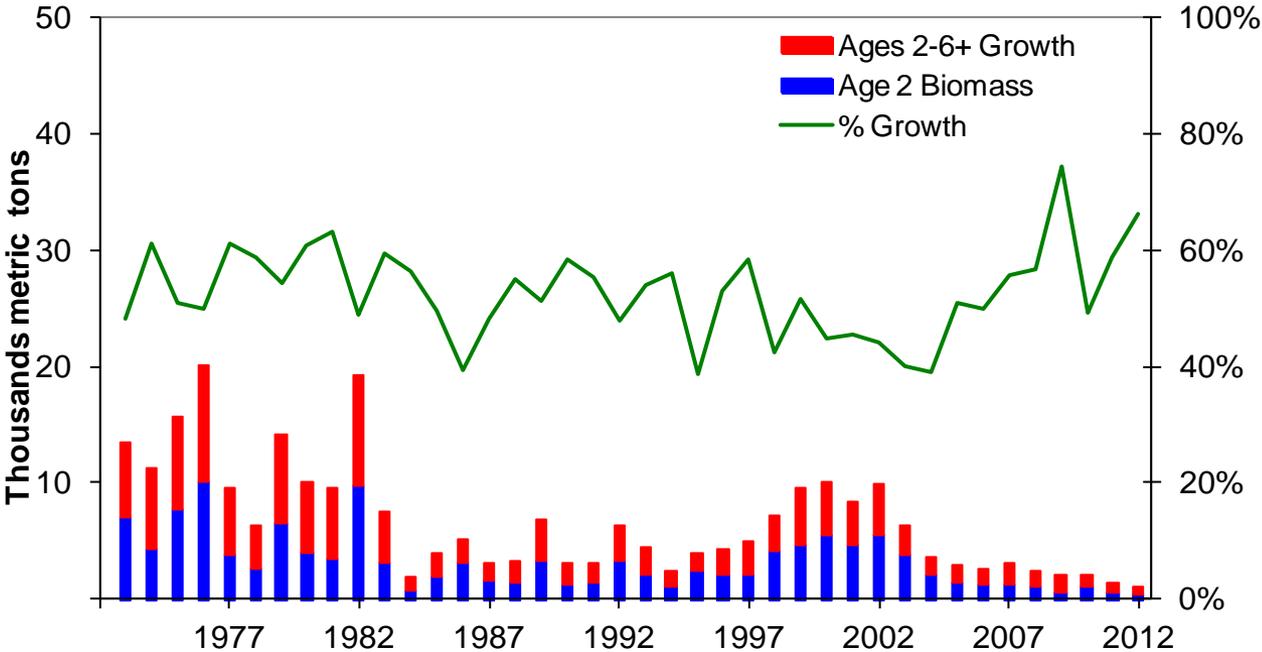
$$\text{Production} = P_y = \text{delta } B_{y,a} + F_{y,a} (\text{biomass}) + M_{y,a} (\text{biomass})$$

$$\text{Total Production} = B_y (\text{age 2}) + P_y$$

$$\text{Surplus Production} = P_y - M_y (\text{biomass})$$

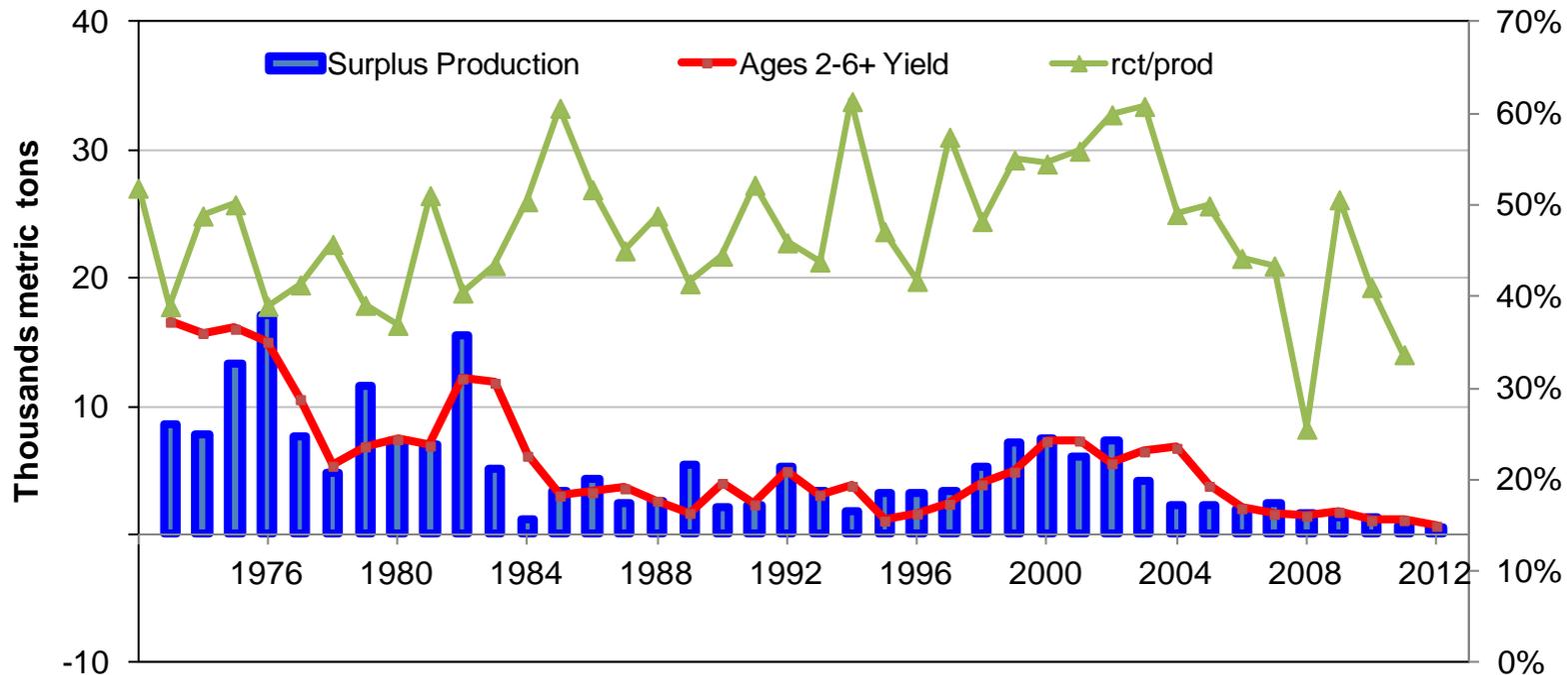
$$\text{Net Production} = SP_y - \text{Yield}_y$$

Results : Growth and Biomass



Percent growth of Age 2 fish represent > 50% of stock growth ~ 68% of years

Surplus Production



Rct/Prod – relative contribution of recruitment to total production

85% of years, recruitment accounted for > 40% of total Production

Positive Net production : 15/40 ~ 38% of 40 year time series

Literature Cited

Legault, C., L. Alade, W.E. Gross, and H.H. Stone 2013. Stock assessment of Georges Bank Yellowtail Flounder for 2013. TRAC Working Paper 2013/15

Rivard, D. 1980. Back-calculating production from cohort analysis, with discussion on surplus production for two redfish stocks. CAFSAC Res. Doc. 80/23