Alaska's Sablefish Fishery

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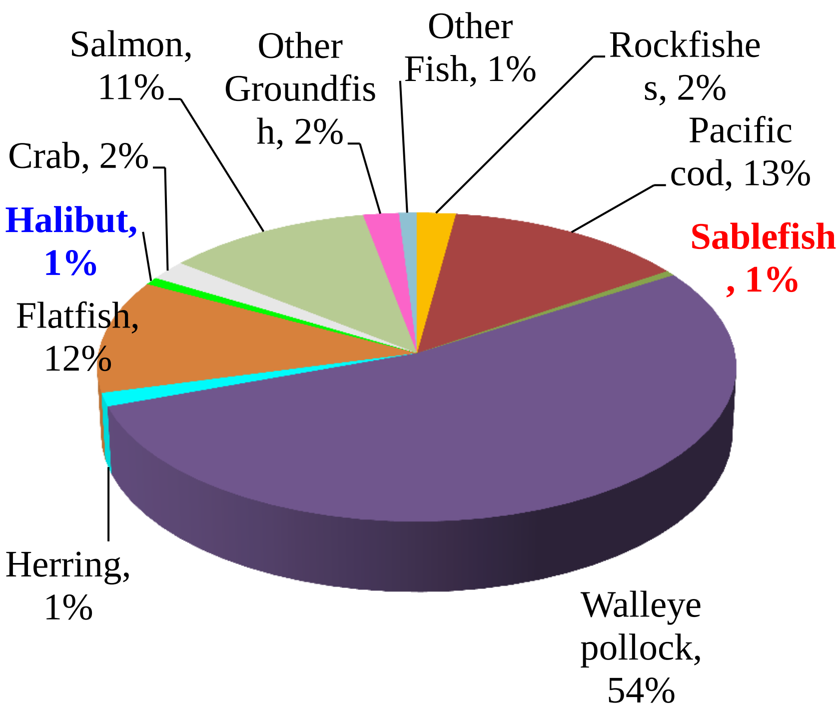
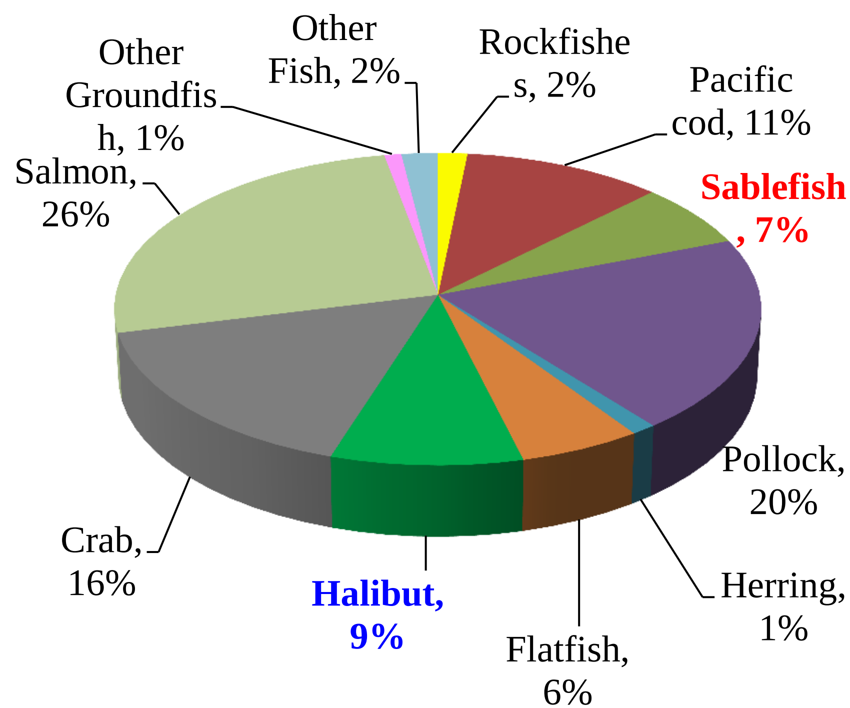
Alaska Commercial Landings (2012)

Volume
2.42 Million MT (56% of US total)



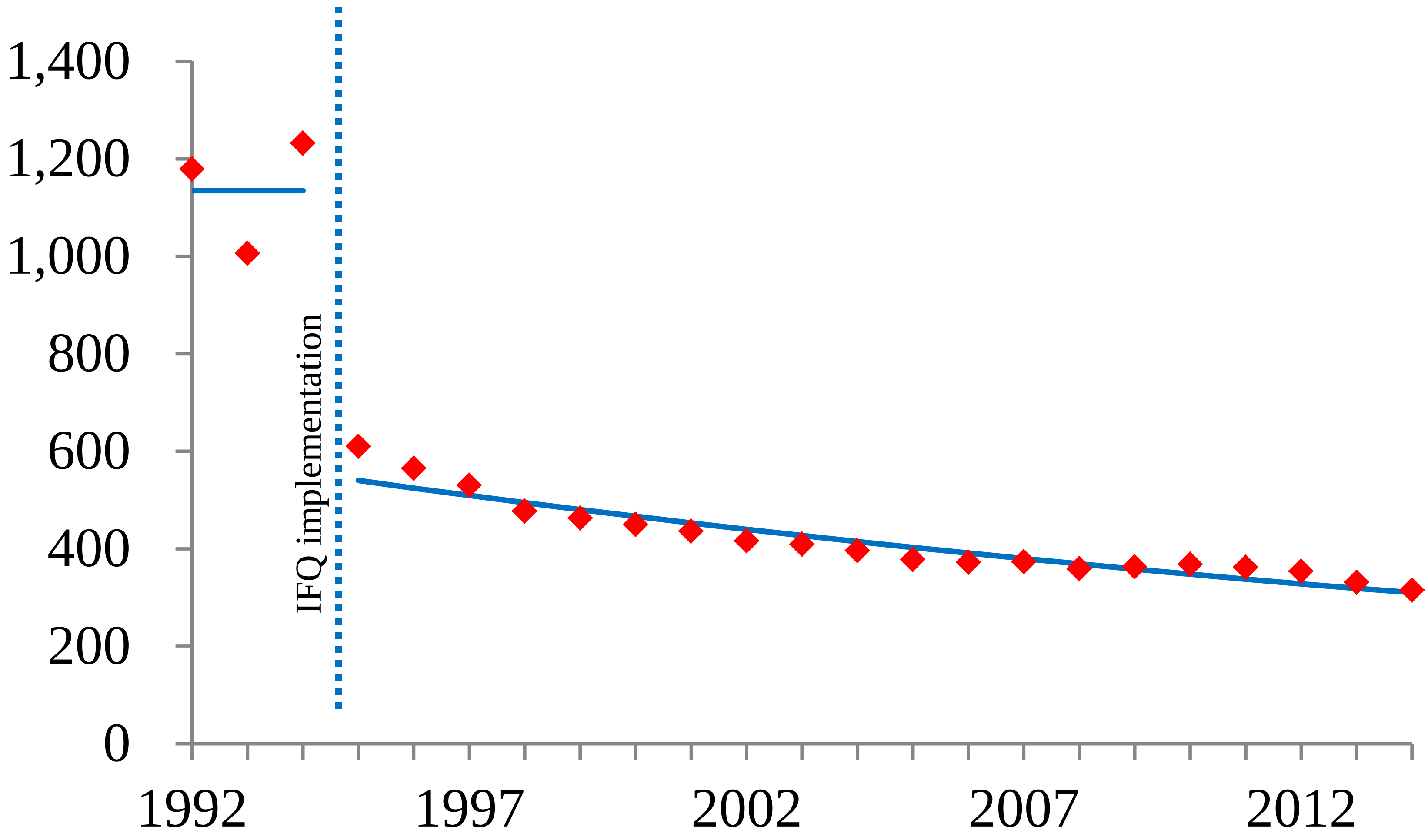
Value
$1.69 Billion (33% of US total)



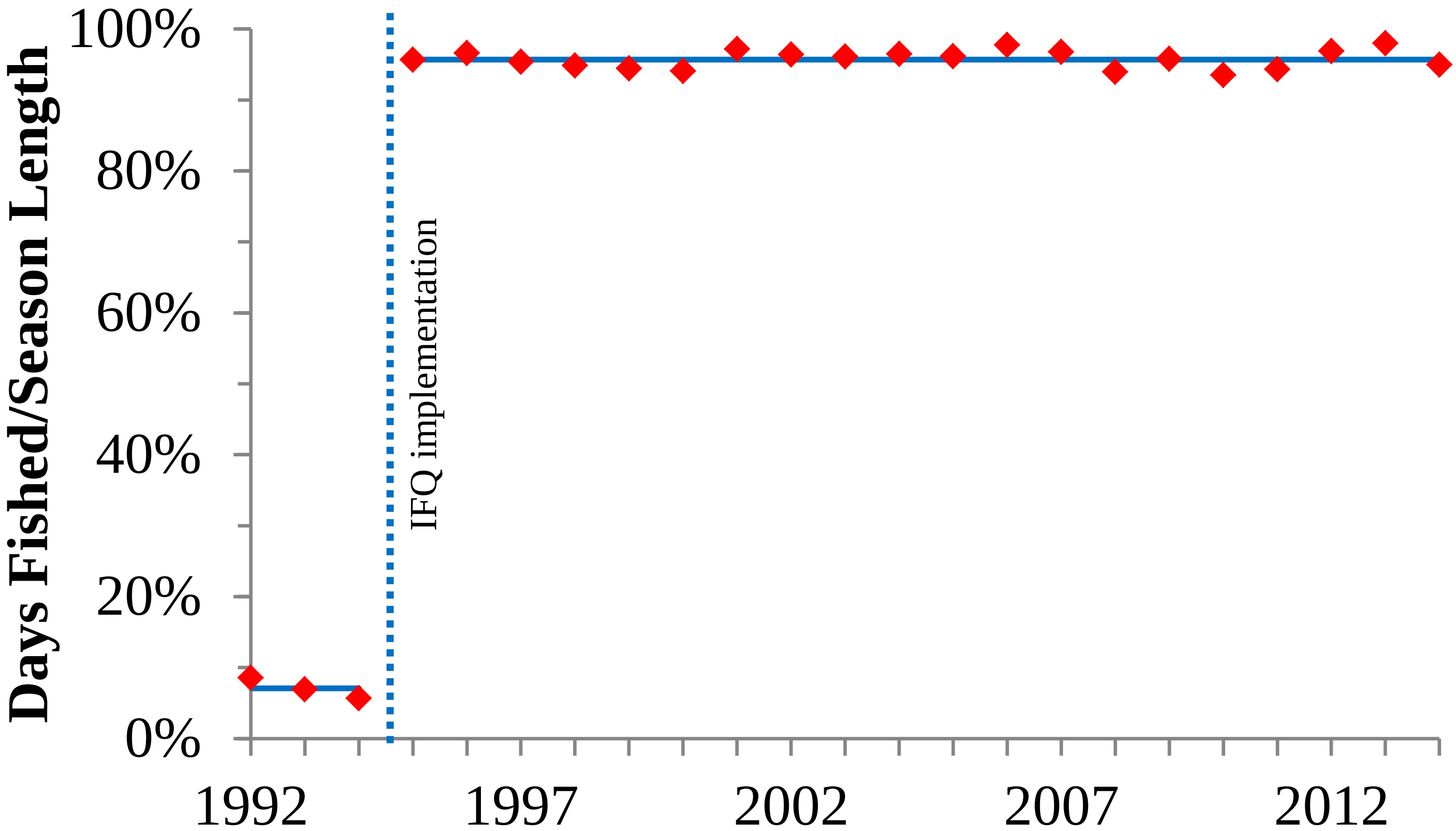
Sablefish IFQ Program

- Implemented in 1995 alongside Halibut IFQ
- 3 vessel classes
- 6 areas
- 1% ownership cap

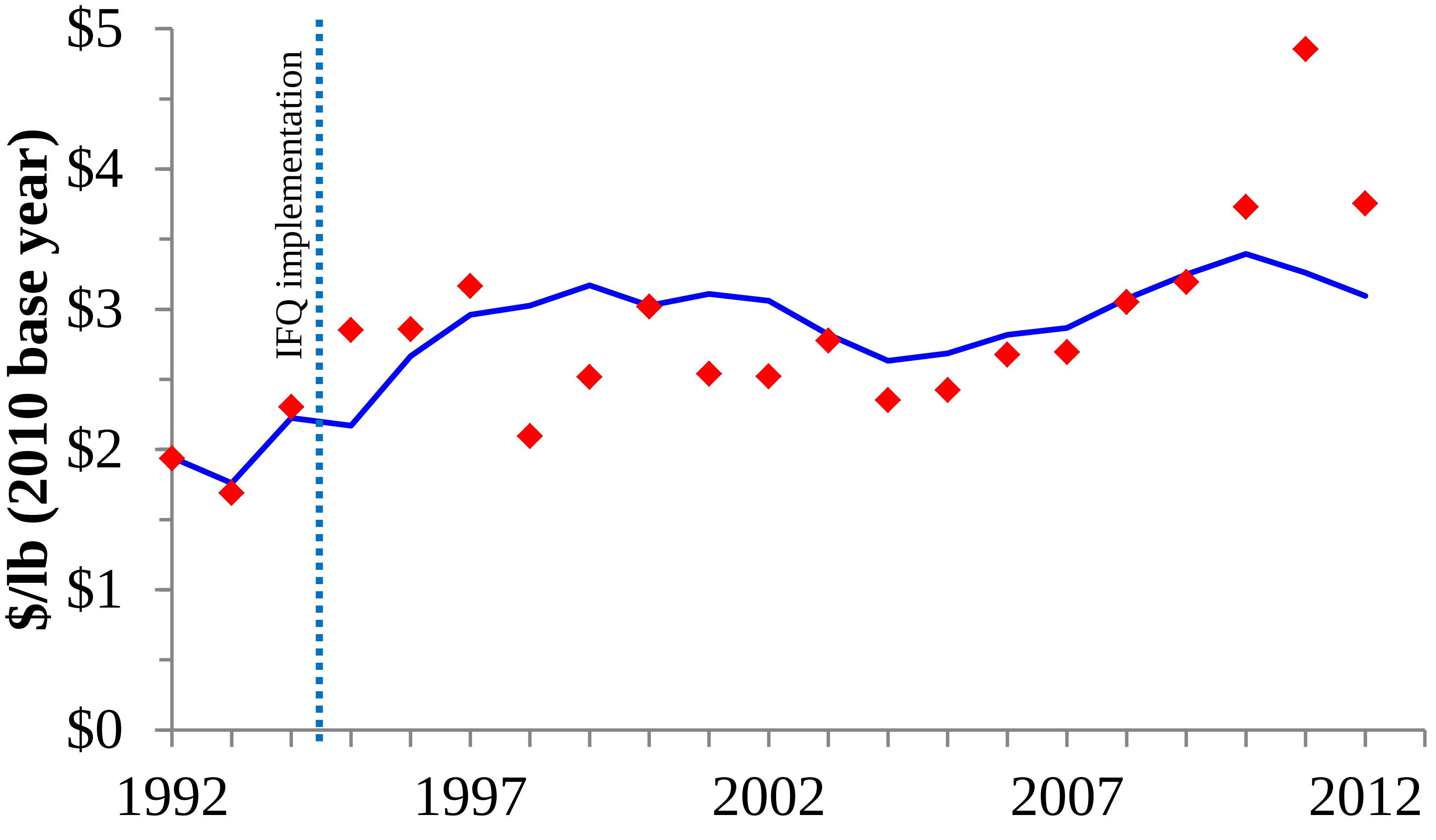
Voluntary Reduction in Vessels



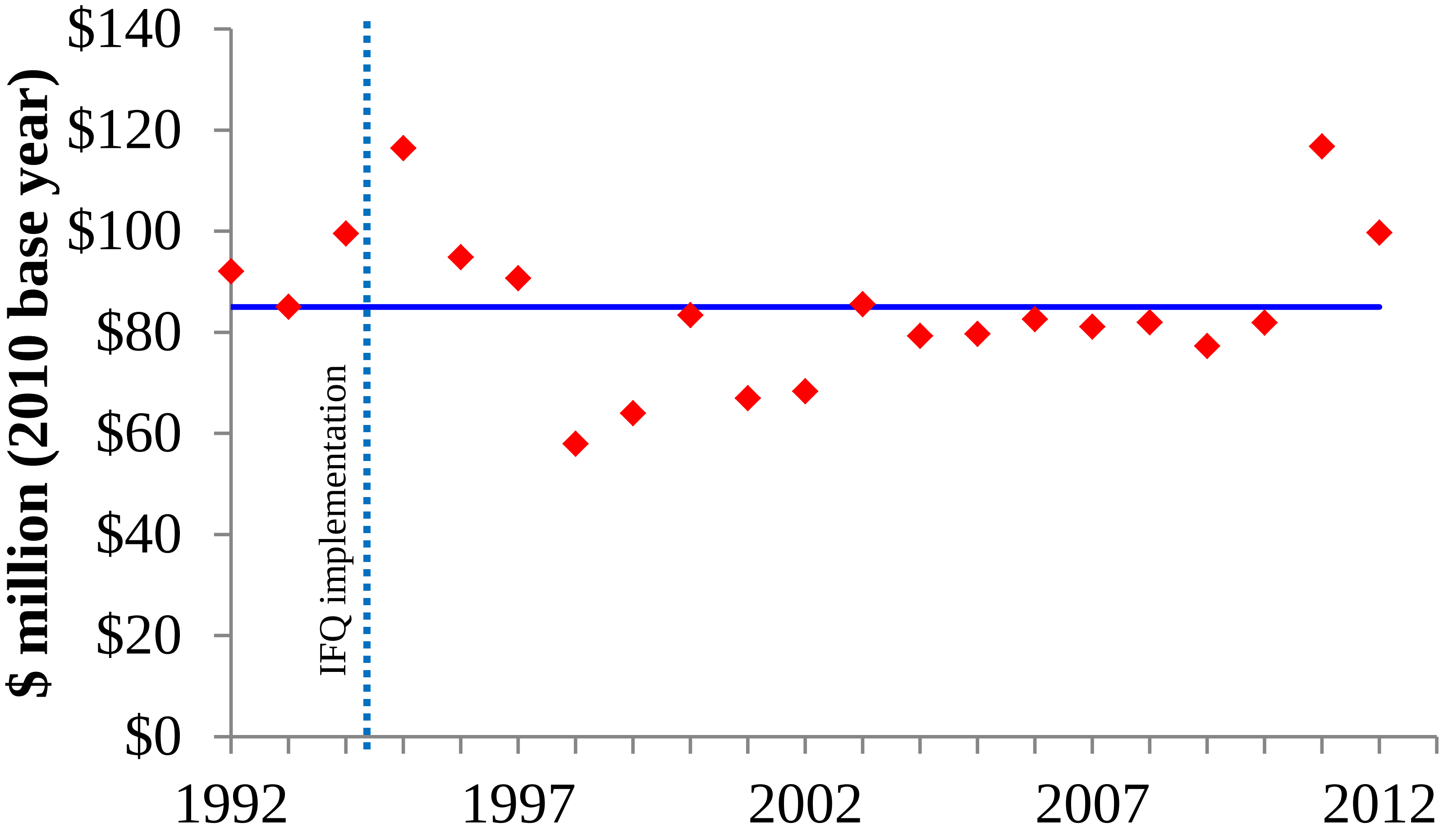
End to Temporal Compression



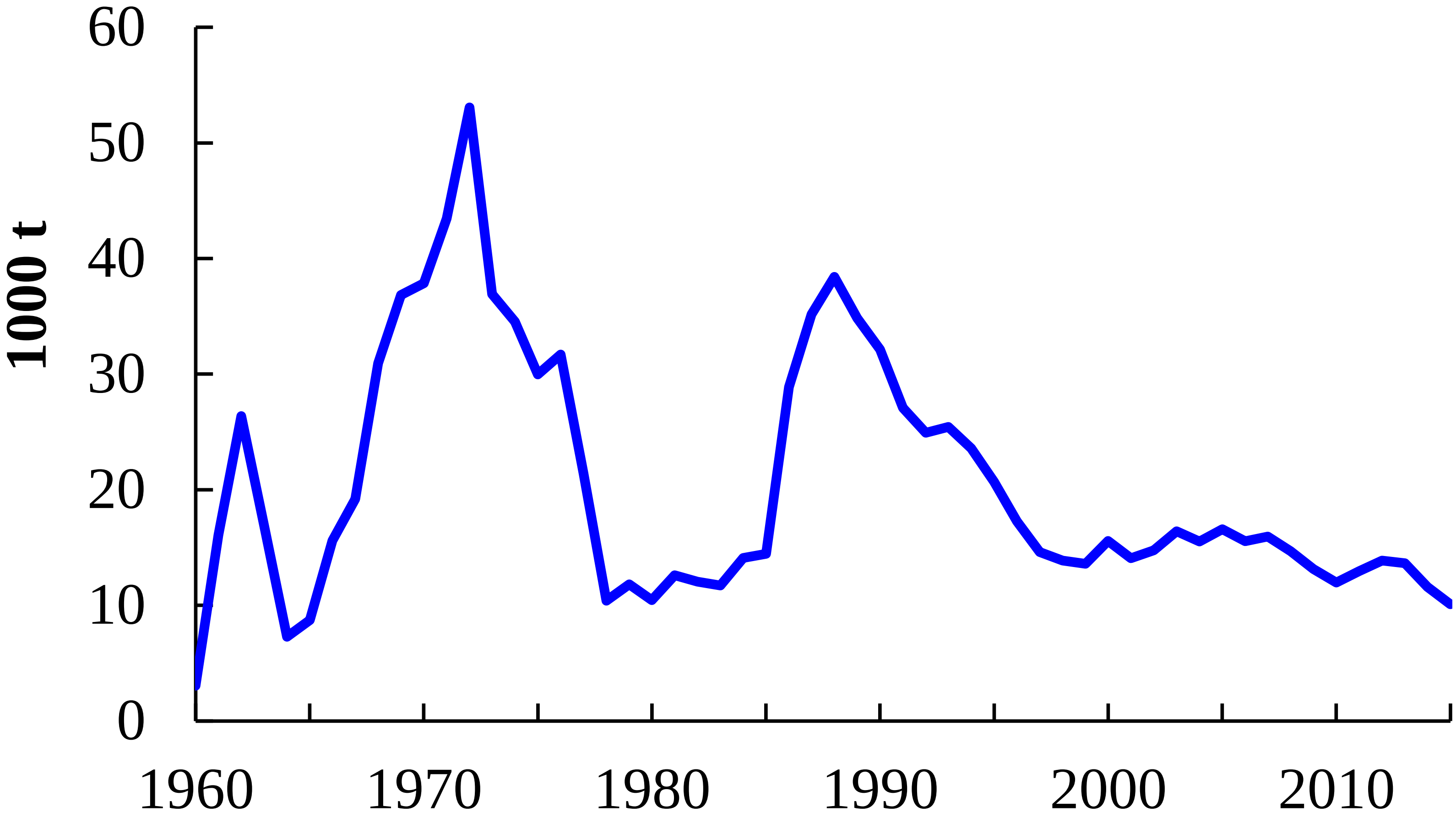
Increase in Exvessel Price?



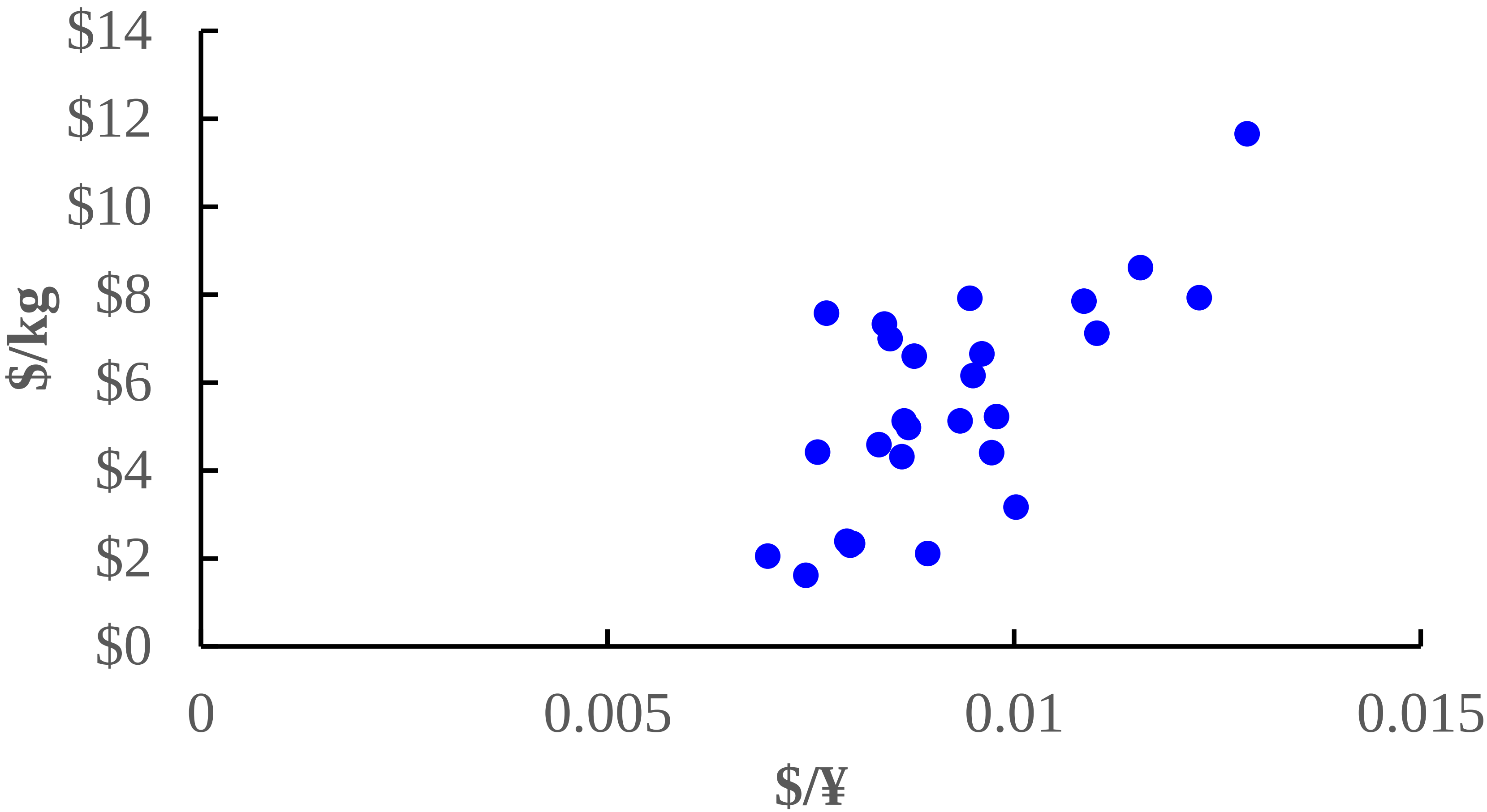
Increase in Exvessel Revenue?



Landings



Exvessel Price and Exchange Rates



Price Determination

Japanese Import Demand

is a function of the real import price, real per-capita Japanese consumption expenditures, and the real price level of meat in Japan

U.S. Export Allocation

is a function of Alaska landings and the real export price that Japan is willing to pay for Sablefish

Alaska Derived Exvessel Demand

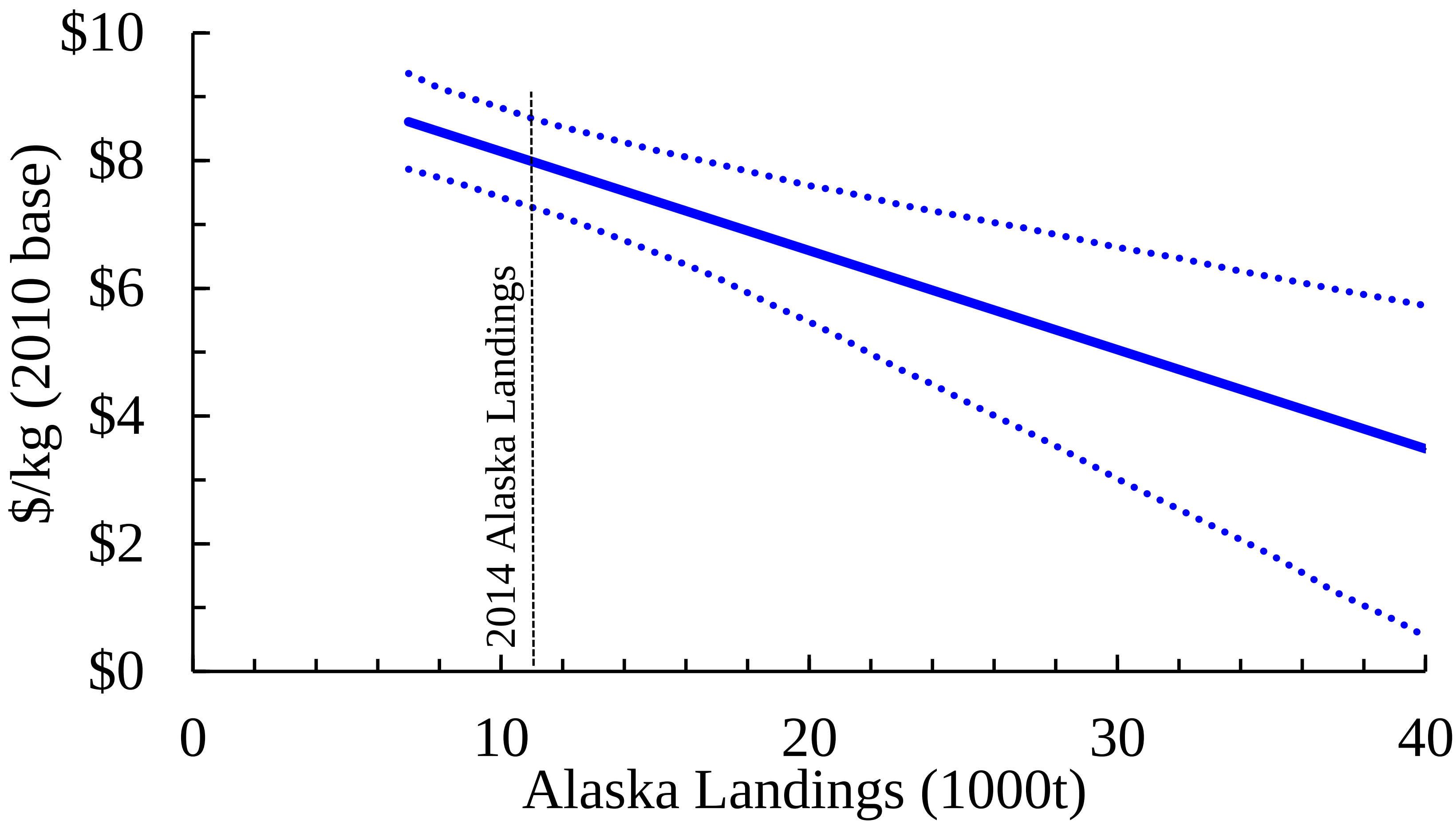
is a mark-down from the Japanese Sablefish real import price

Warpinski et al. 2016. Alaska's sablefish fishery after Individual Fishing Quota Program implementation: an international economic market model. *North American Journal of Fisheries Management* 36: 864–875.

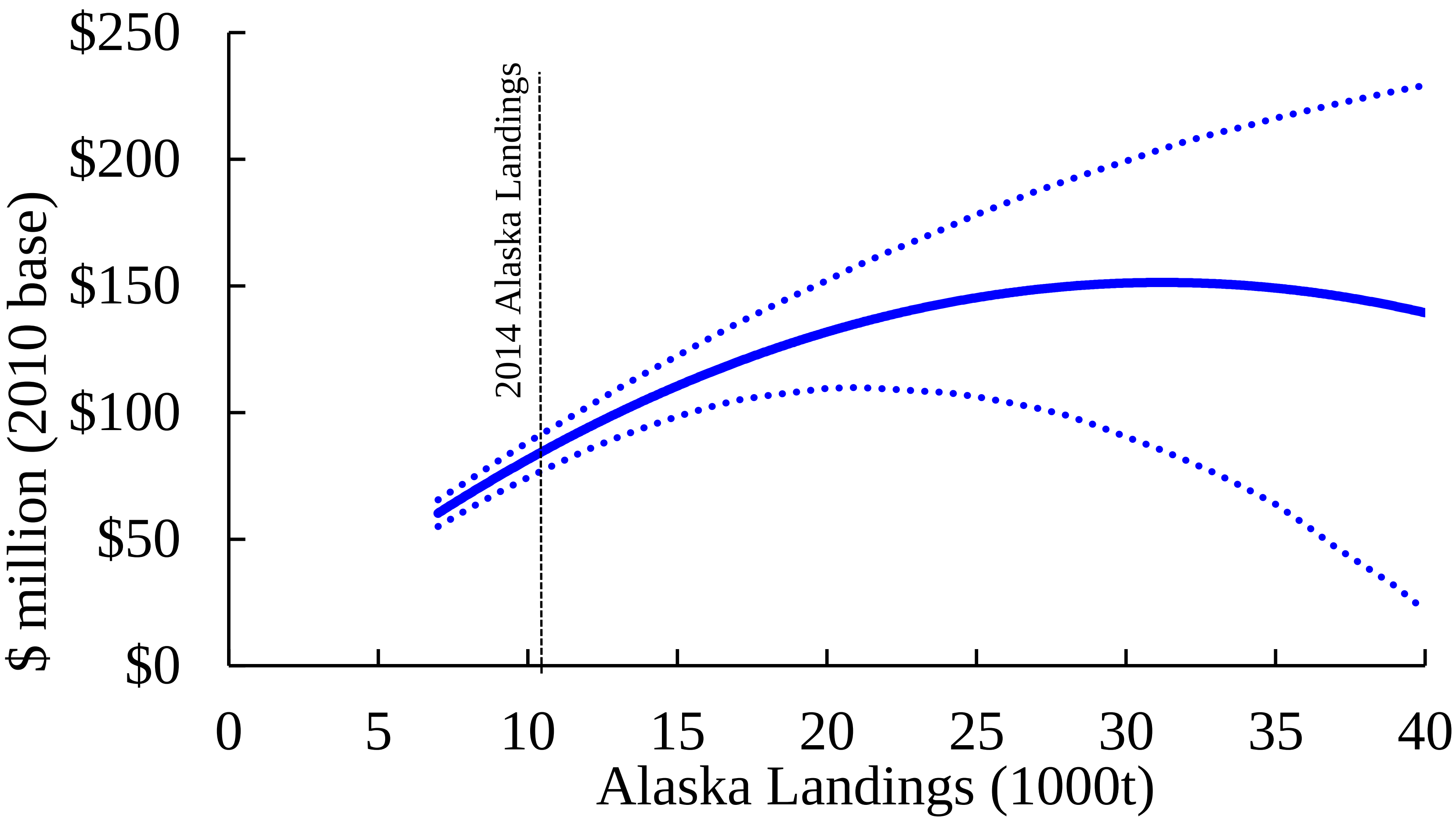
Price Determination

$$\begin{pmatrix} \dfrac{Q_t^S}{Pop_t^J} \\ Q_t^S \\ P_t^{exv} \end{pmatrix} = \begin{pmatrix} b_{10} & b_{11} & b_{12} & b_{13} & 0 & 0 & 0 \\ b_{20} & 0 & 0 & 0 & b_{21} & b_{22} & 0 \\ b_{30} & 0 & 0 & 0 & 0 & b_{31} & b_{32} \end{pmatrix} \begin{pmatrix} 1 \\ P_t^J / J_t^{cpi} \\ I_t^J / J_t^{cpi} \\ P_t^{Jsub} / J_t^{cpi} \\ L_t^{AK} \\ \dfrac{P_t^J Exch_t}{US_t^{ppi}} \\ \dfrac{L_t^{AK}}{days_t} \end{pmatrix} + \begin{pmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \end{pmatrix}$$

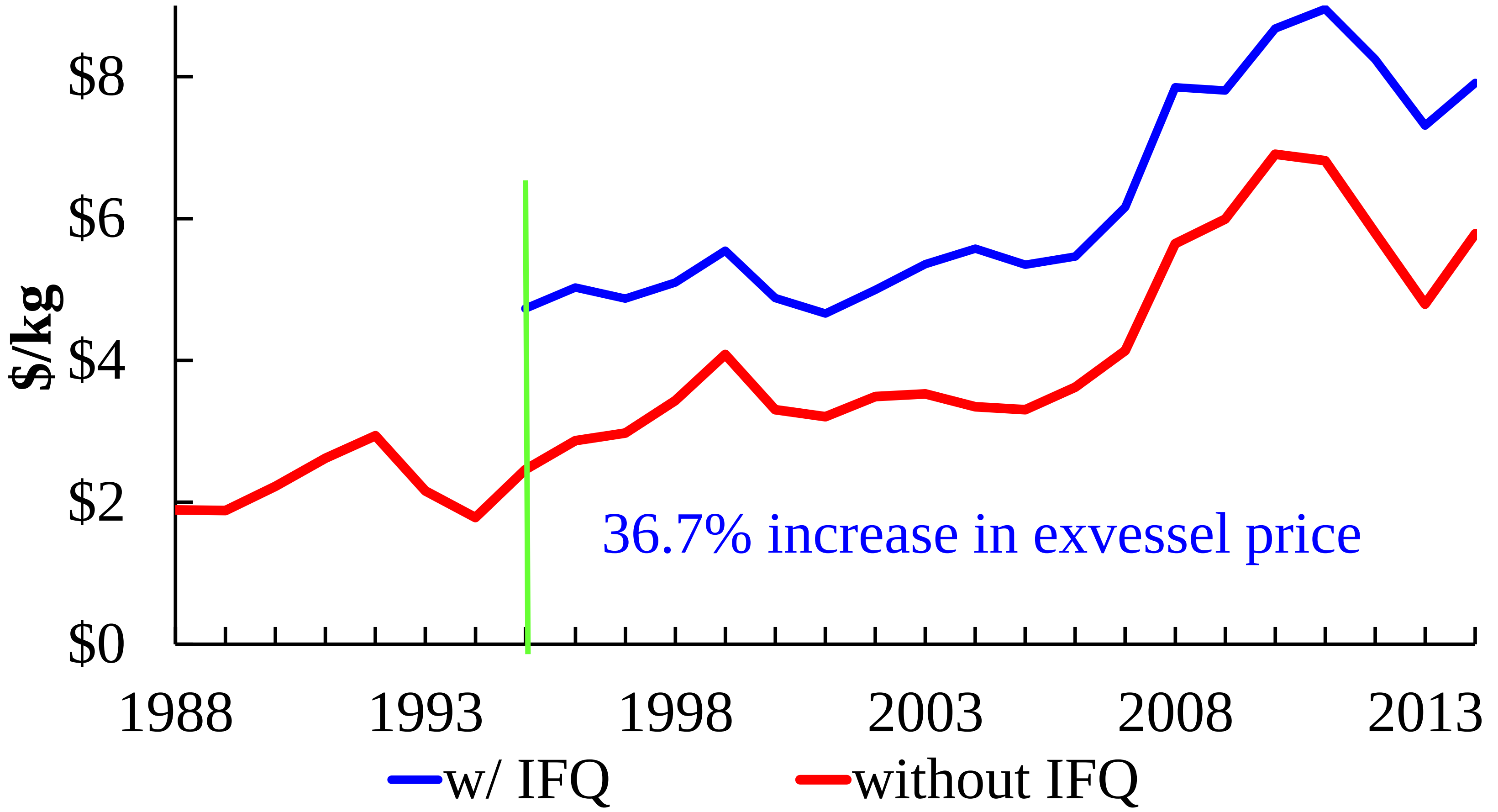
Exvessel Demand



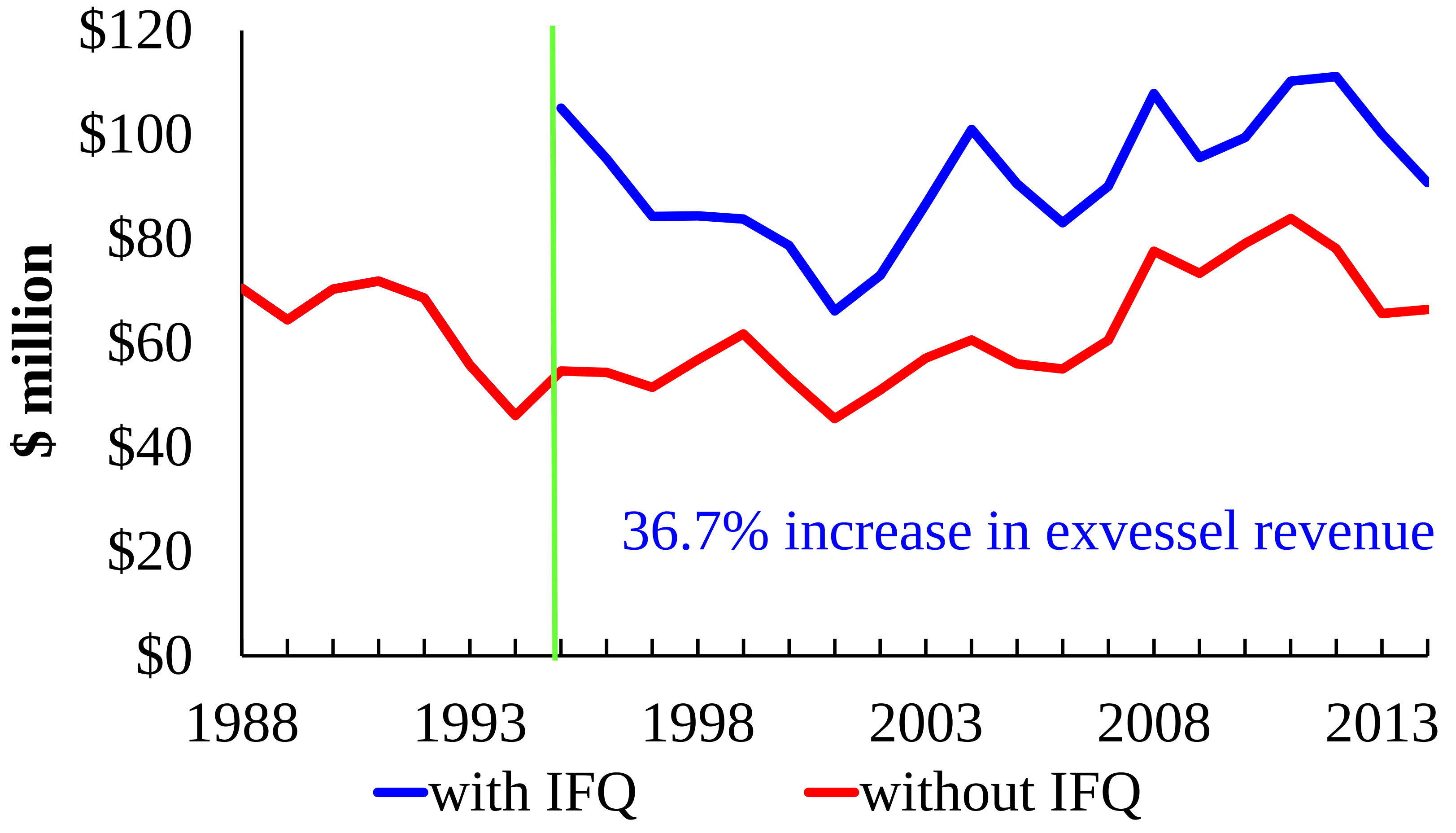
Exvessel Revenue



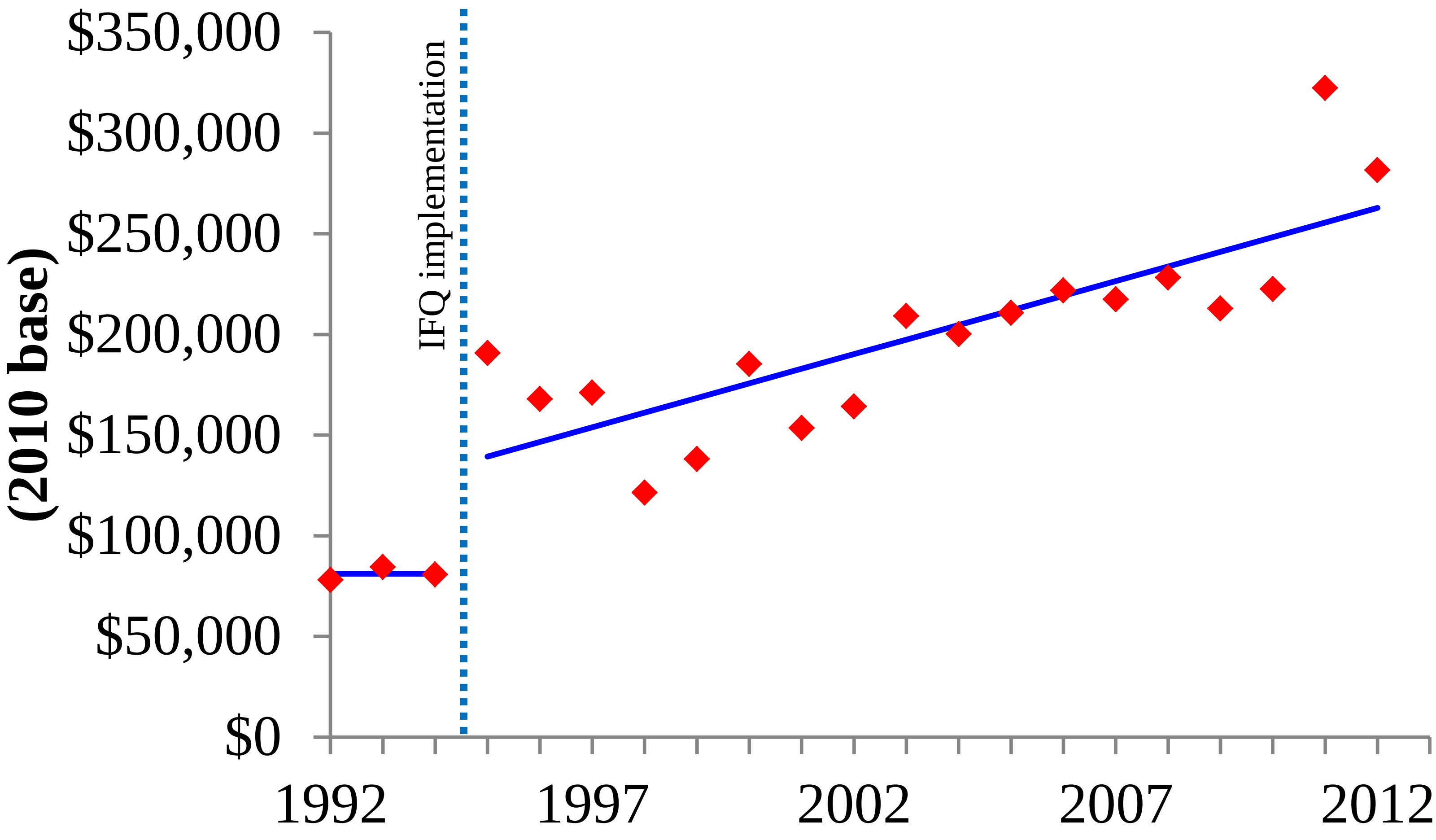
Exvessel Price



Exvessel Revenue



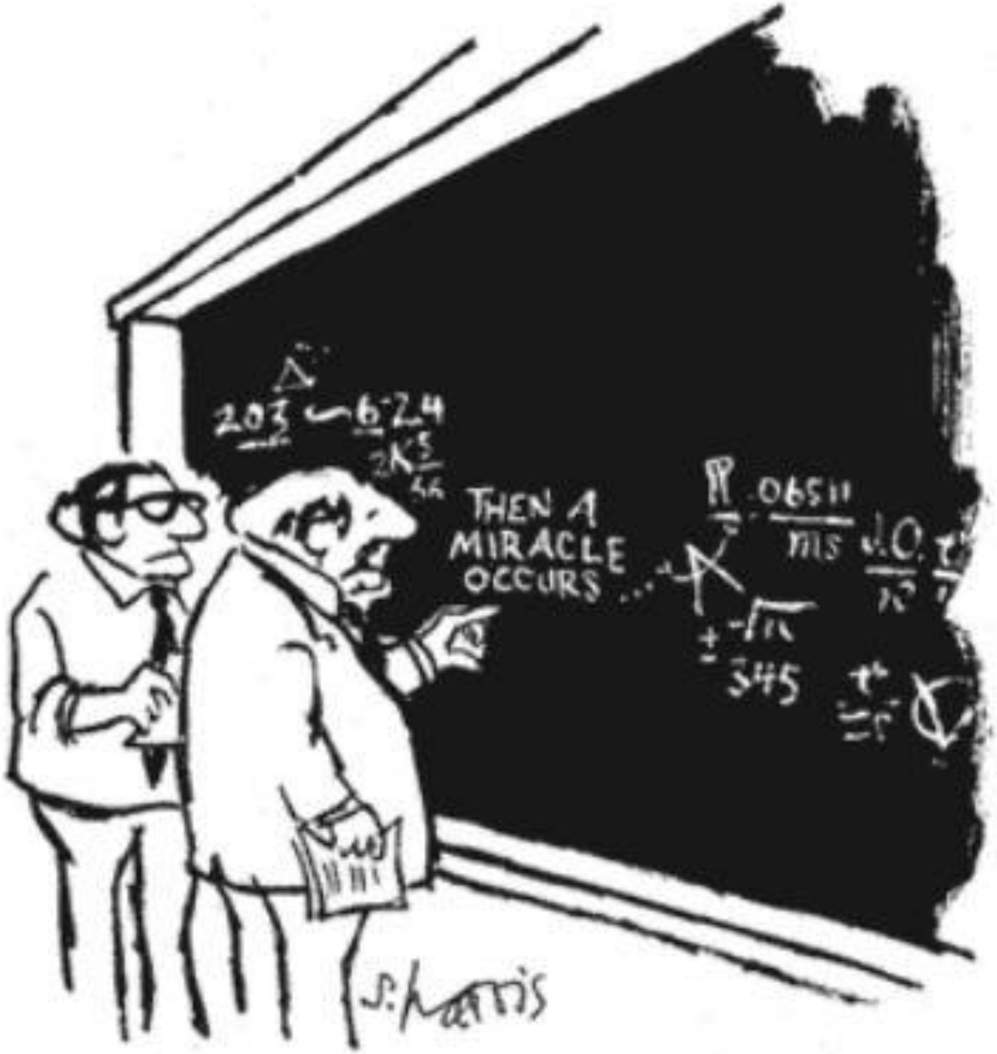
Exvessel Revenue/Vessel



Sablefish Stock Dynamics & Management

Input:

CPUE & catch at age in survey & fishery

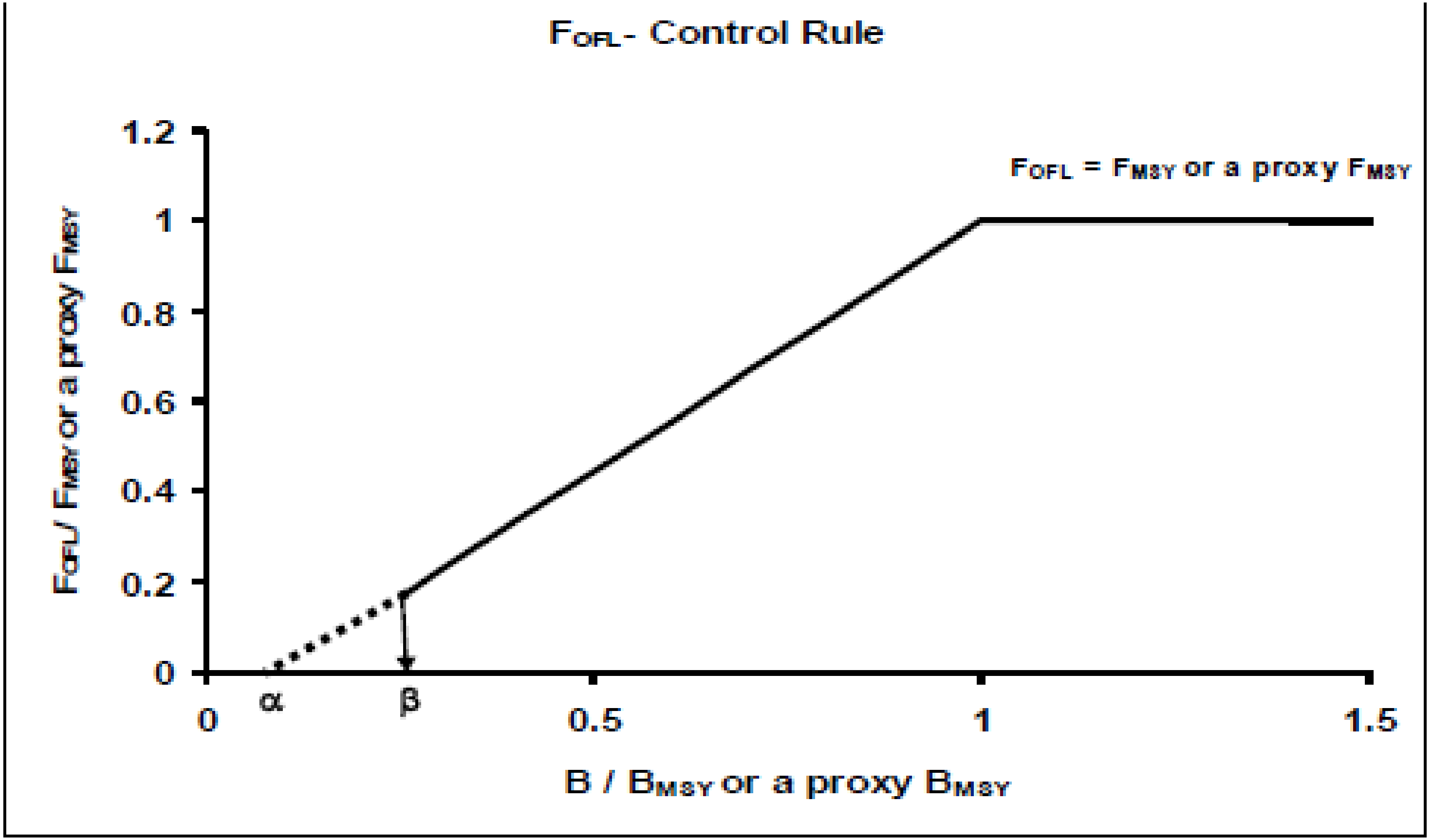


"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Output:

Catch limits

NPFMC Harvest Control Rule



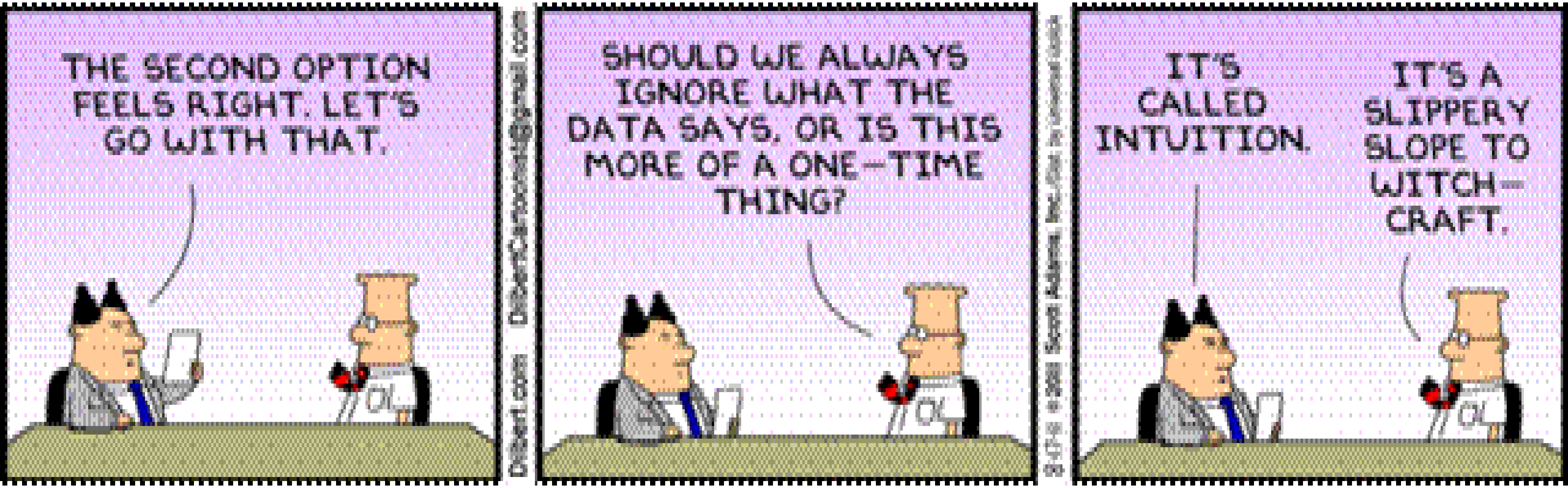
Groundfish Harvest Control Rule

	Stock Status		
	$\frac{B_t}{B_{MSY}} \leq \alpha$	$\alpha < \frac{B_t}{B_{MSY}} \leq 1$	$1 < \frac{B_t}{B_{MSY}}$
OFL	0	$F30\% \left(\frac{B_t}{B_{MSY}} - 0.05 \right) \Big/ 0.95$	$F30\%$
ABC	0	$F40\% \left(\frac{B_t}{B_{MSY}} - 0.05 \right) \Big/ 0.95$	$F40\%$

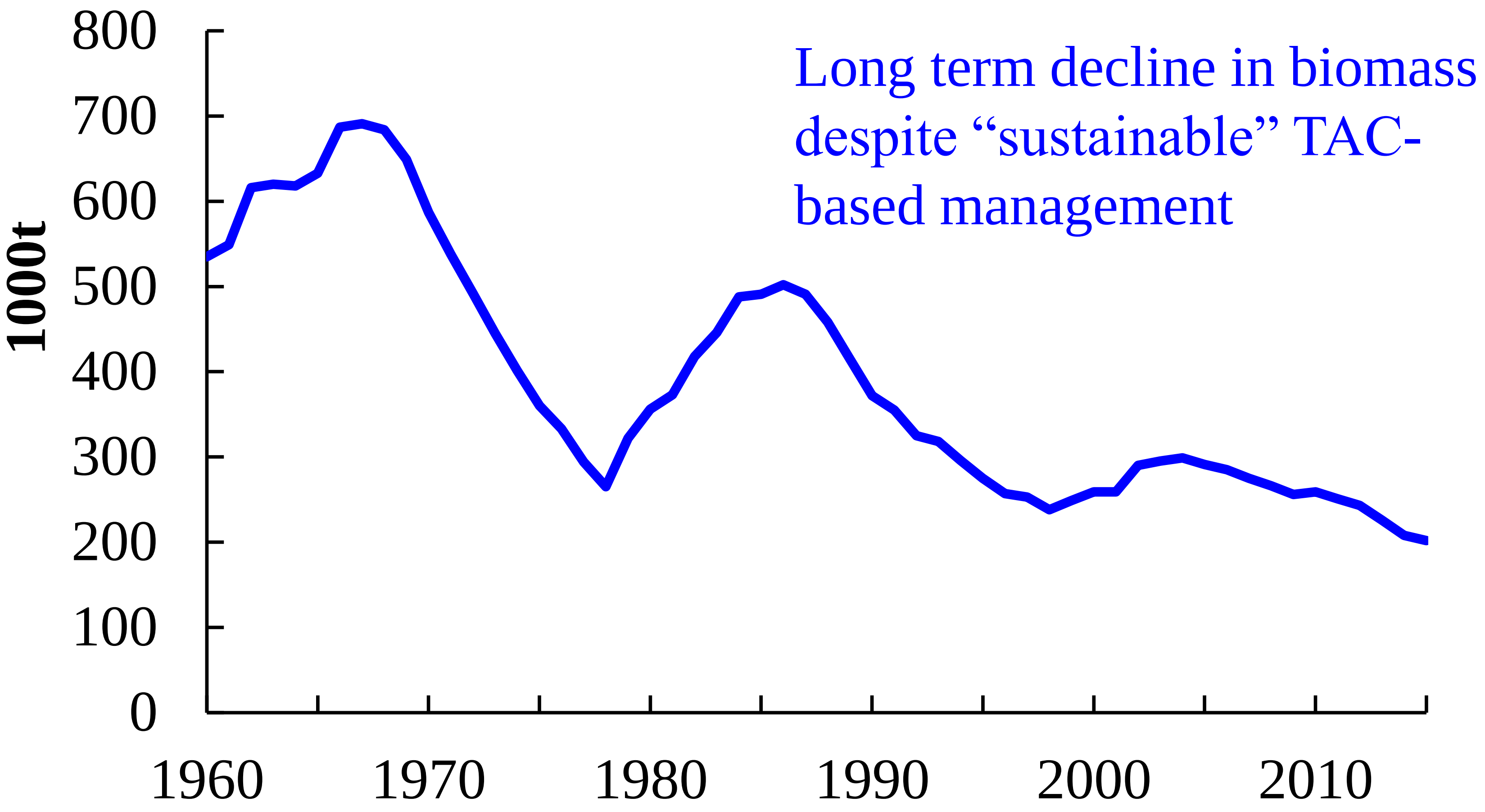
$$MSY \geq OFL \geq ABC \geq TAC \geq catch$$

It is pointless to set harvest control rules and biological reference points based on values of variables that are, at best, observed with considerable error and may, in fact, be entirely unobservable

Doug Butterworth (ICES ASM 2013)



Biomass

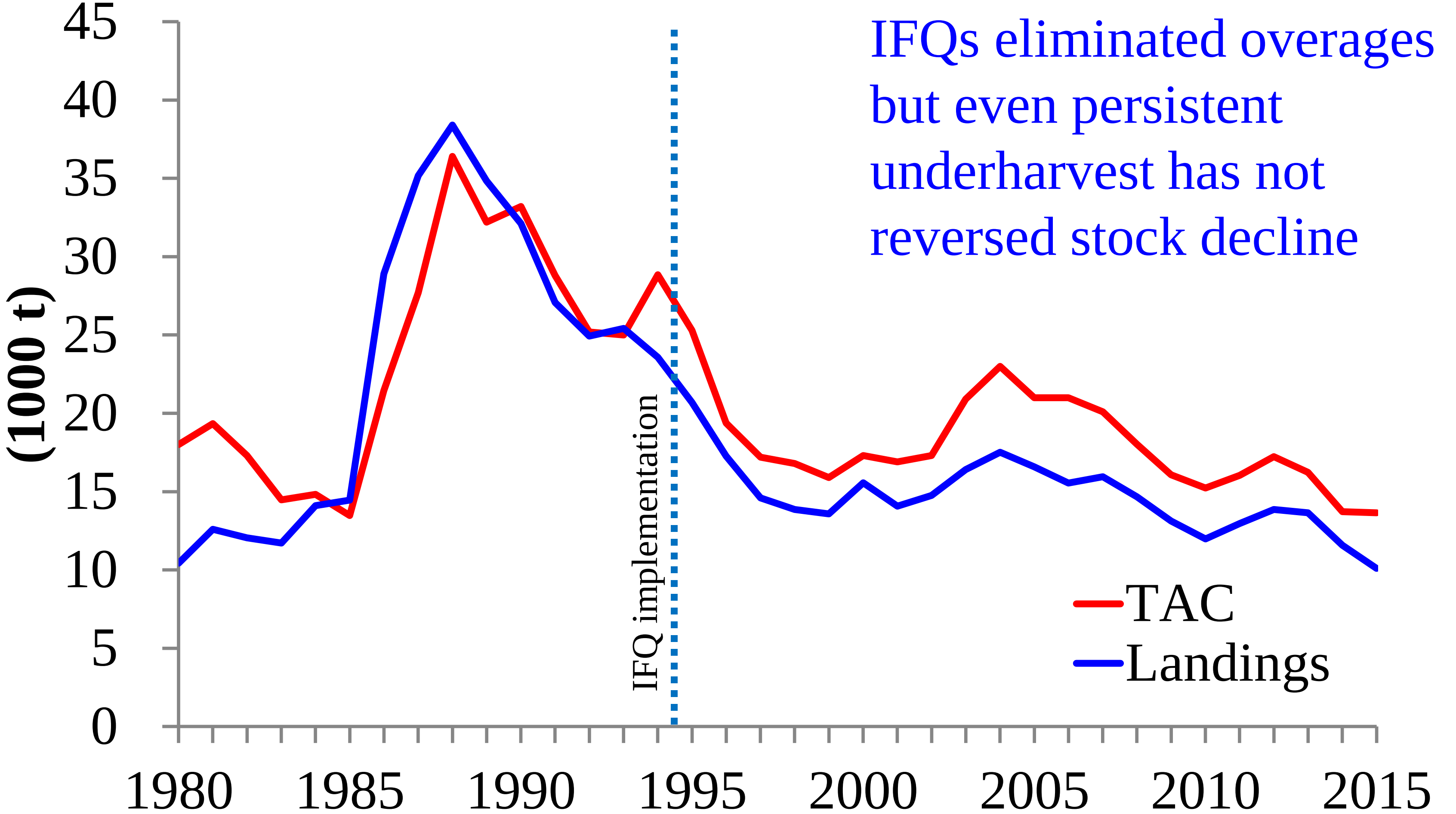


1000t
800
700
600
500
400
300
200
100
0
1960
1970
1980
1990
2000
2010
Long term decline in biomass despite “sustainable” TAC-based management

Stock Assessment

Quantity/Status	As estimated or specified *last* year for: 2015	2016	As estimated or recommended *this* year for: 2016*	2017*
M (natural mortality rate)	0.10	0.10	0.10	0.10
Tier	3b	3b	3b	3b
Projected total (age 2+) biomass (t)	219,997	227,042	204,796	214,552
Projected female spawning biomass (t)	91,183	88,345	86,471	81,986
$B_{100\%}$	262,269	262,269	257,018	257,018
$B_{40\%}$	104,908	104,908	102,807	102,807
$B_{35\%}$	91,794	91,794	89,956	89,956
F_{OFL}	0.098	0.091	0.093	0.086
$maxF_{ABC}$	0.082	0.078	0.078	0.073
F_{ABC}	0.082	0.078	0.078	0.073
OFL (t)	16,128	14,658	13,397	12,747
max ABC (t)	13,657	12,406	11,795	10,782
ABC (t)	13,657	12,406	11,795	10,782
Status	As determined *last* year for: 2013	2014	As determined *this* year for: 2014	2015
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

TAC and Landings



Whale Depredation

Peterson[†] MJ, Mueter F, Criddle KR, Haynie AC. 2014. Killer whale depredation and associated costs to Alaskan sablefish, Pacific halibut and Greenland turbot longliners. *PLoS ONE* 9(2): e88906. (DOI: 10.1371/journal.pone.0088906).

Stock Dynamics

$$x_t = \beta_1 x_{t-1} + \beta_2 x_{t-1}^2 + \beta_3 r_{t-1} - \beta_4 h_t + \varepsilon_t$$

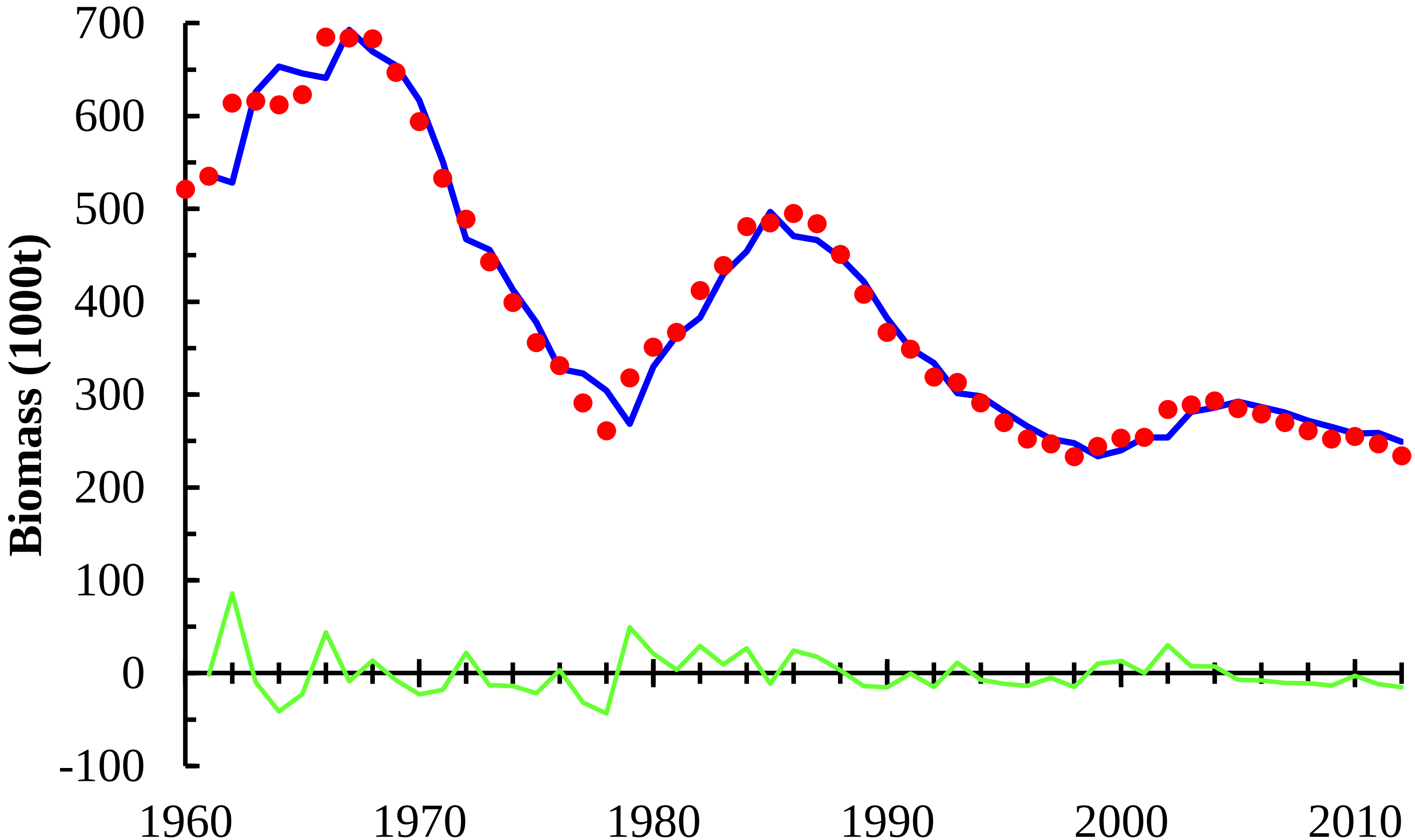
$$ssx_t = \alpha_0 + \alpha_1 x_t + \alpha_2 x_{t-1} + \xi_t$$

$$\ln(r_t) = \begin{cases} prob(\text{low } r_t) \times \left(\ln\left(r_{t|\text{low } r}\right) = \widehat{\gamma}_1 ssx_{t-2} + \widehat{\gamma}_2 ssx_{t-2}^2 + \upsilon_t \right) \\ prob(\text{high } r_t) \times \left(\ln\left(r_{t|\text{high } r}\right) = \breve{\gamma}_1 ssx_{t-2} + \breve{\gamma}_2 ssx_{t-2}^2 + \upsilon_t \right) \end{cases}$$

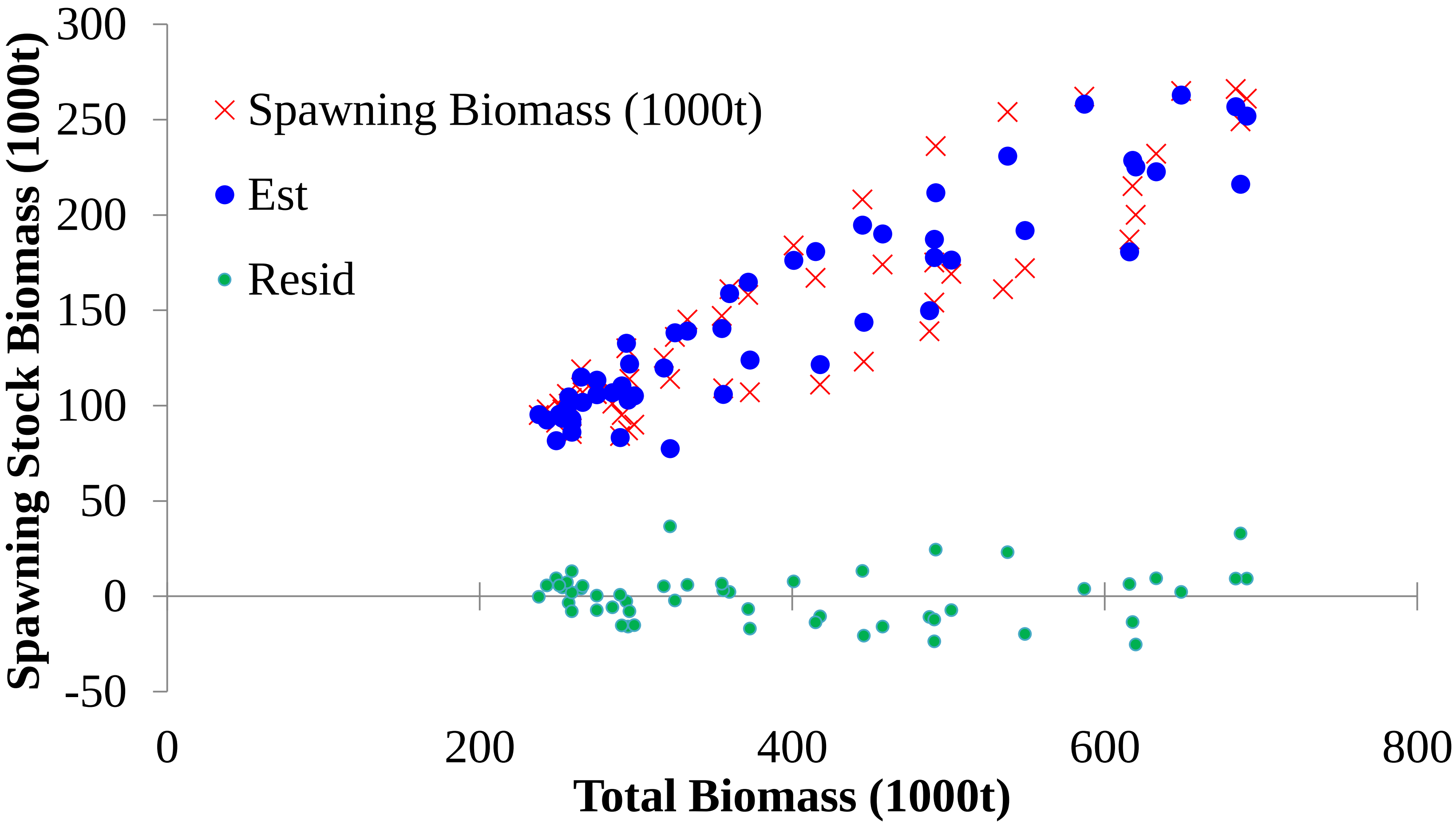
$$\begin{pmatrix} \varepsilon_t \\ \xi_t \\ \upsilon_t \\ \mathbf{Y}_t \end{pmatrix} = \mathbf{C}\mathbf{z}_t + \eta_t$$

$$\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \mathbf{B}\eta_t$$

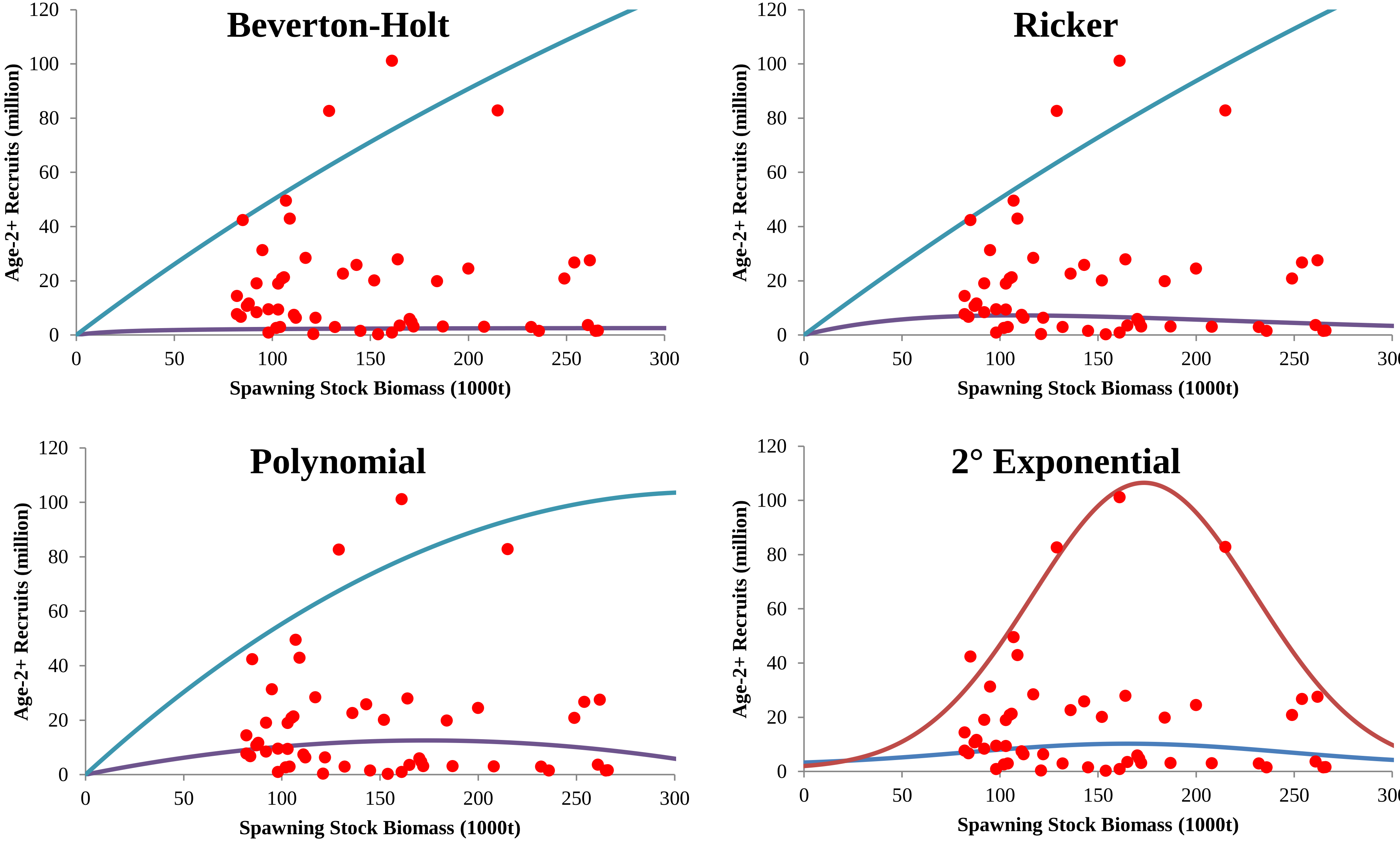
Stock Dynamics



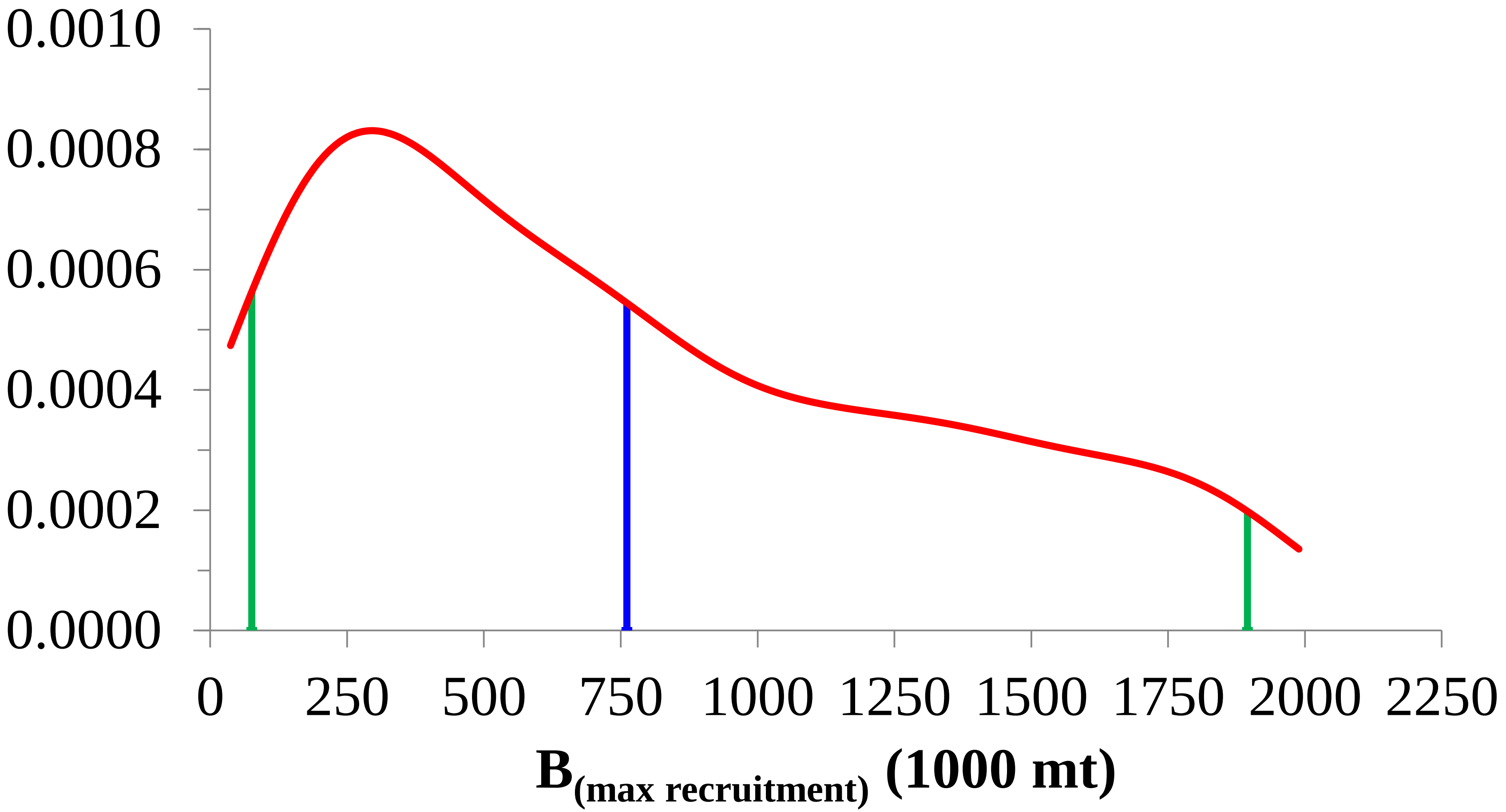
Spawning Stock Dynamics



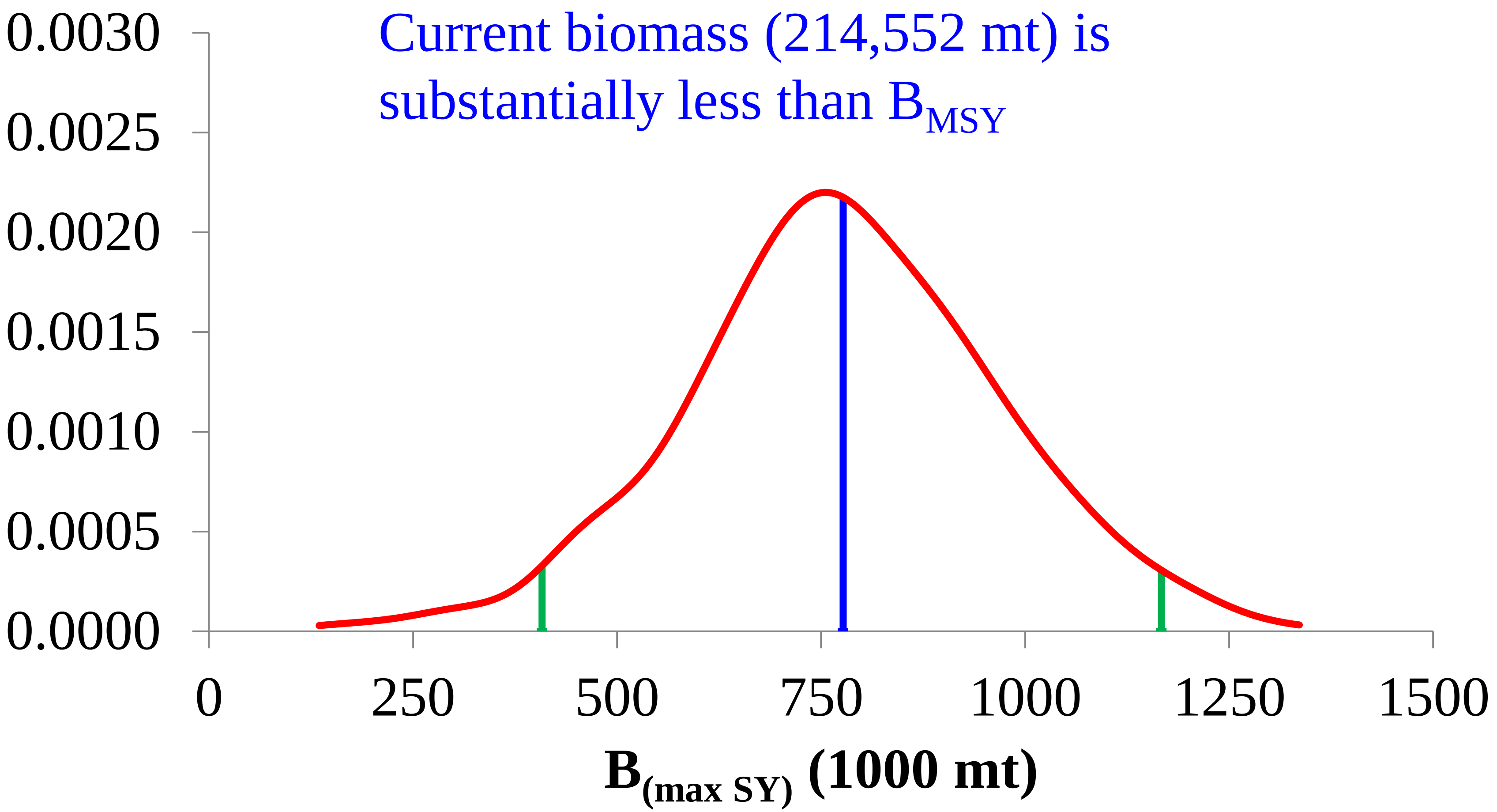
Recruitment Dynamics



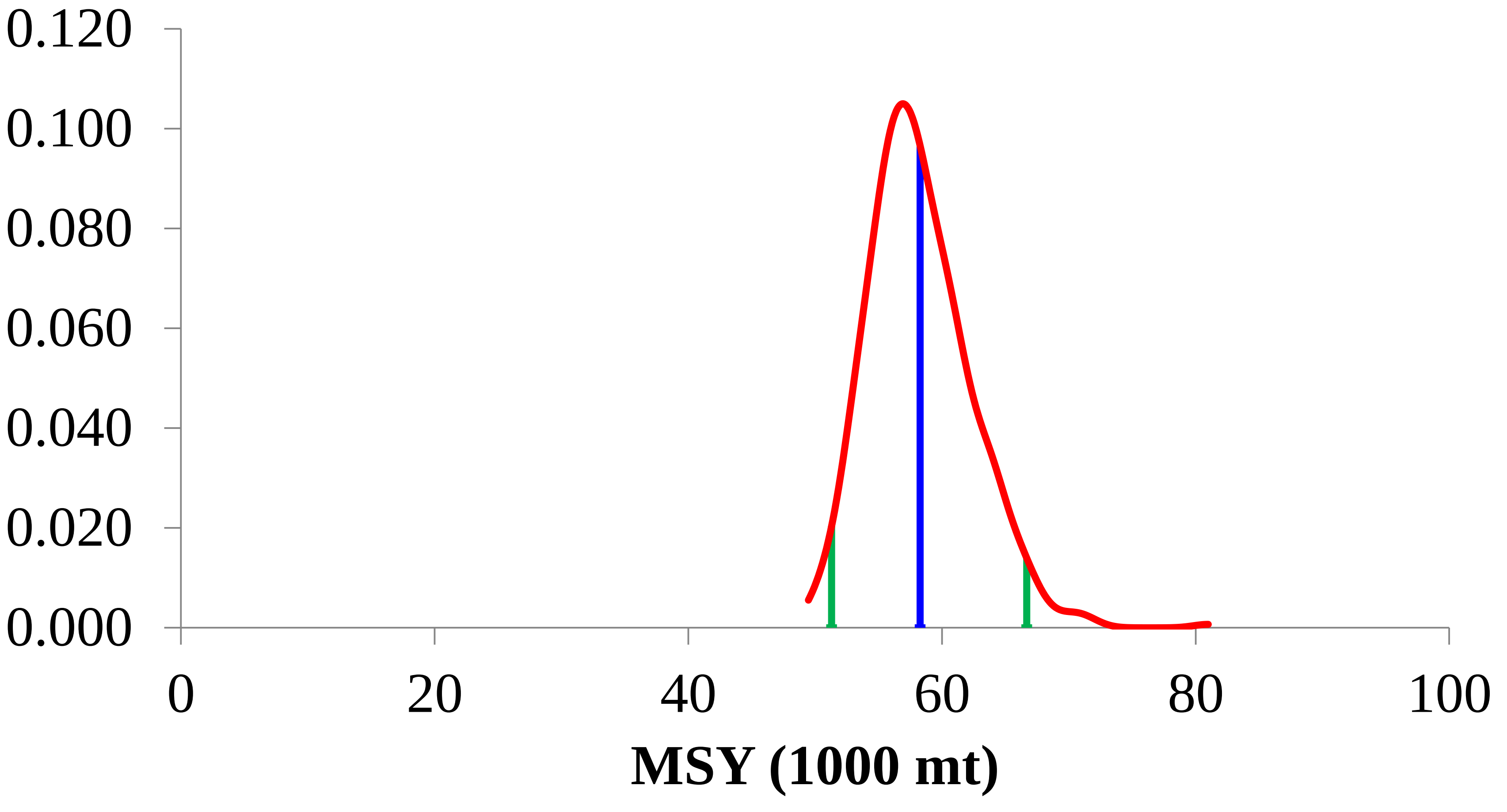
PDF of Recruitment Maxima



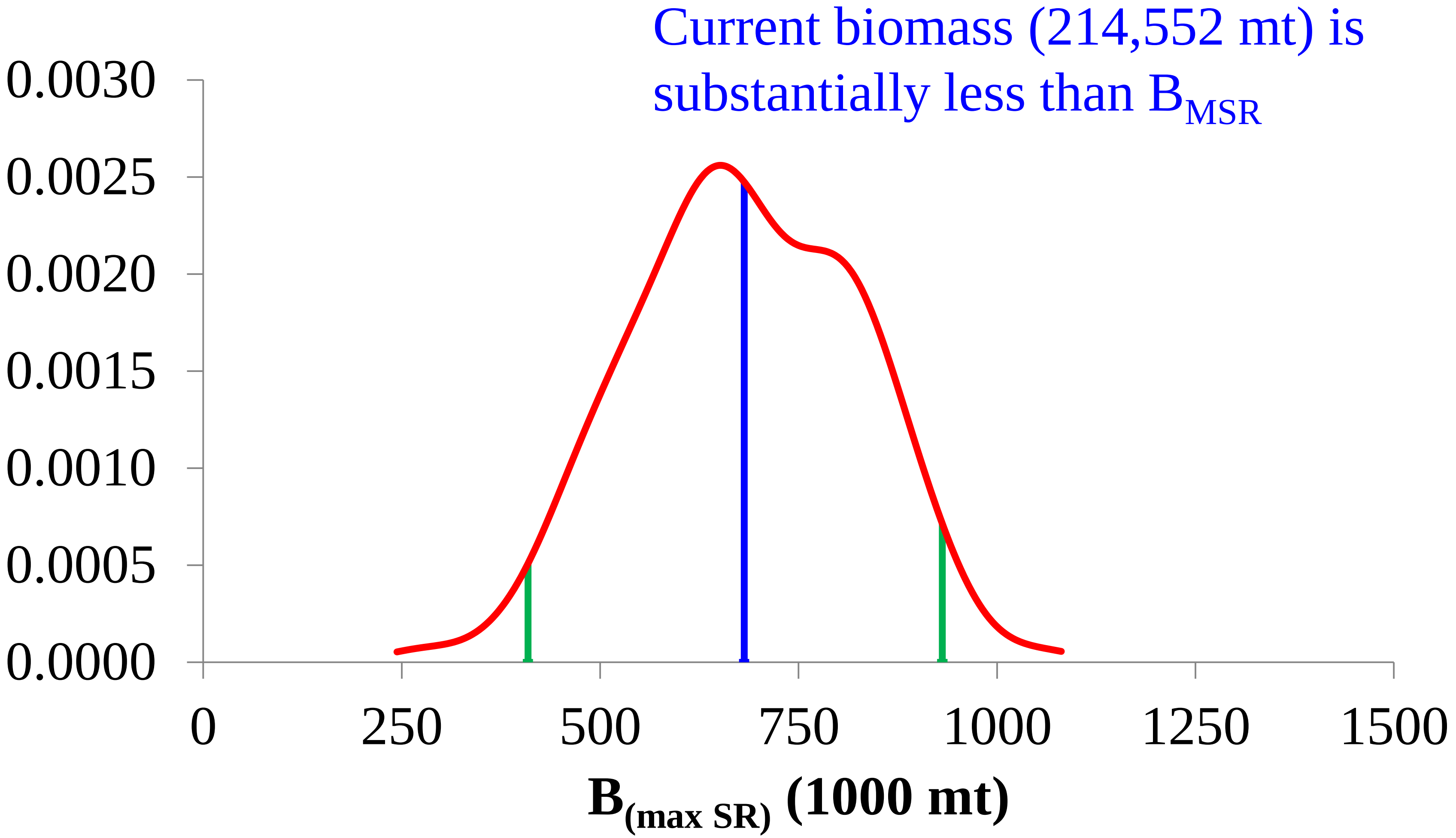
PDF of MSY Maxima



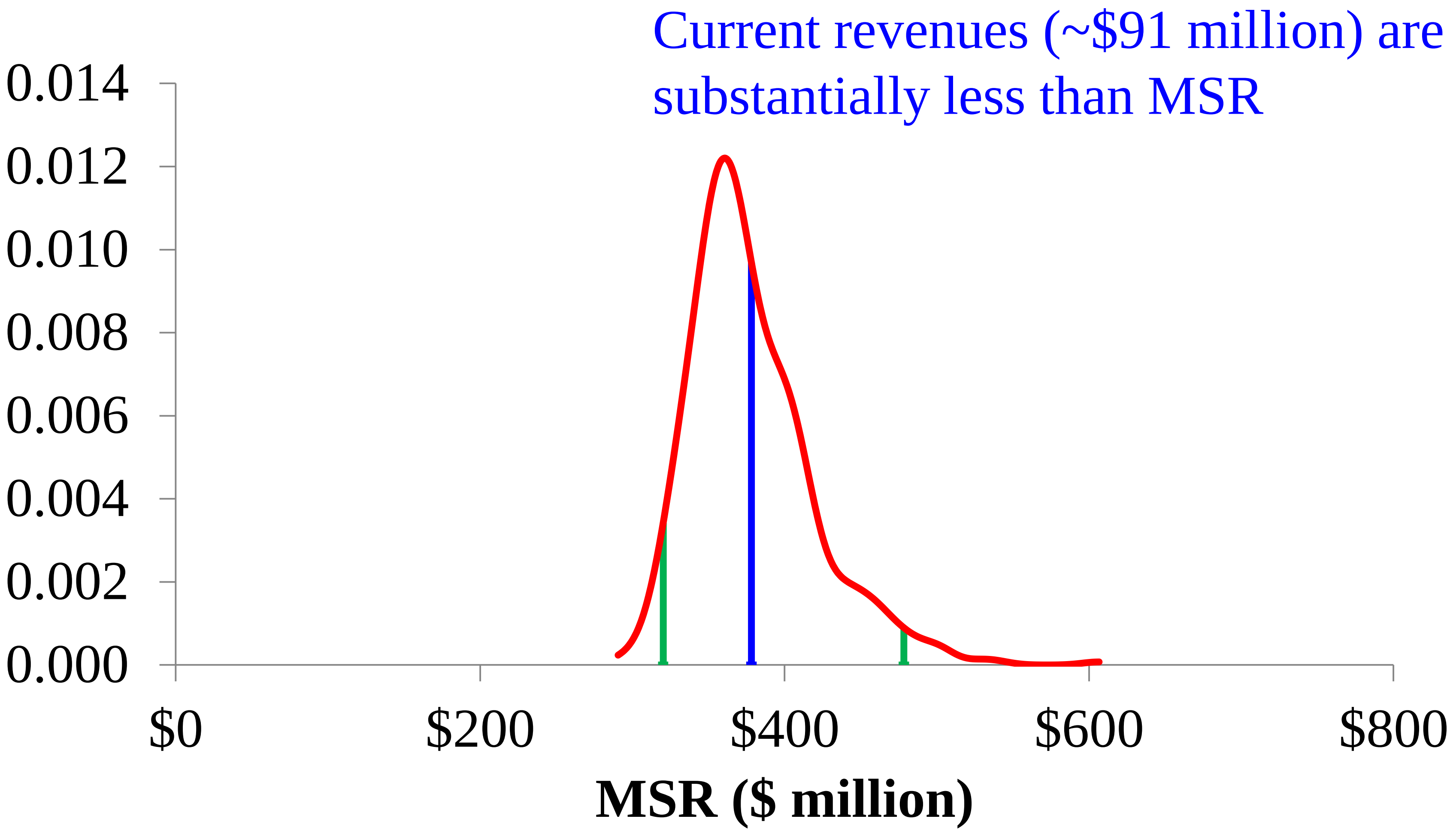
PDF of MSY



PDF of MSR Maxima



PDF of MSR



Current revenues (~$91 million) are substantially less than MSR
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
$0
$200
$400
$600
$800
MSR ($ million)

Alaska sablefish, sustainability gone awry?