

West Coast Groundfish Case Study: Using ACLs and Other MSA Tools to Bring a Multispecies Fishery Back from the Brink

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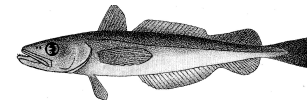


The Groundfish Fishery Management Plan Includes a Wide Variety of Species

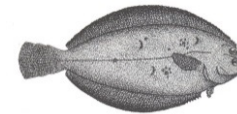
"Rockfish" 63



Roundfish 6



Flatfish 12



Elasmobranchs 6



"Others" 3

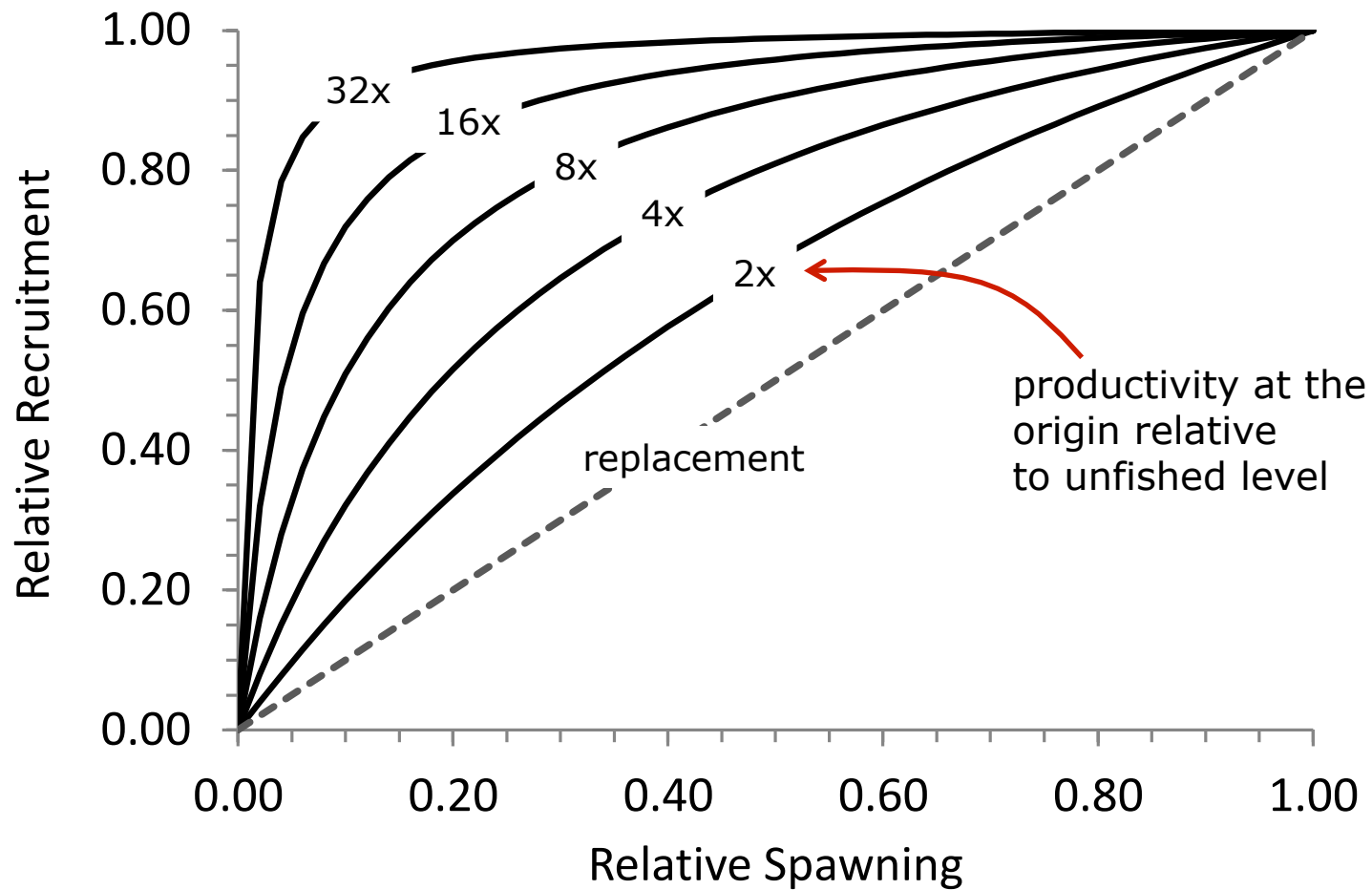


Total: 90

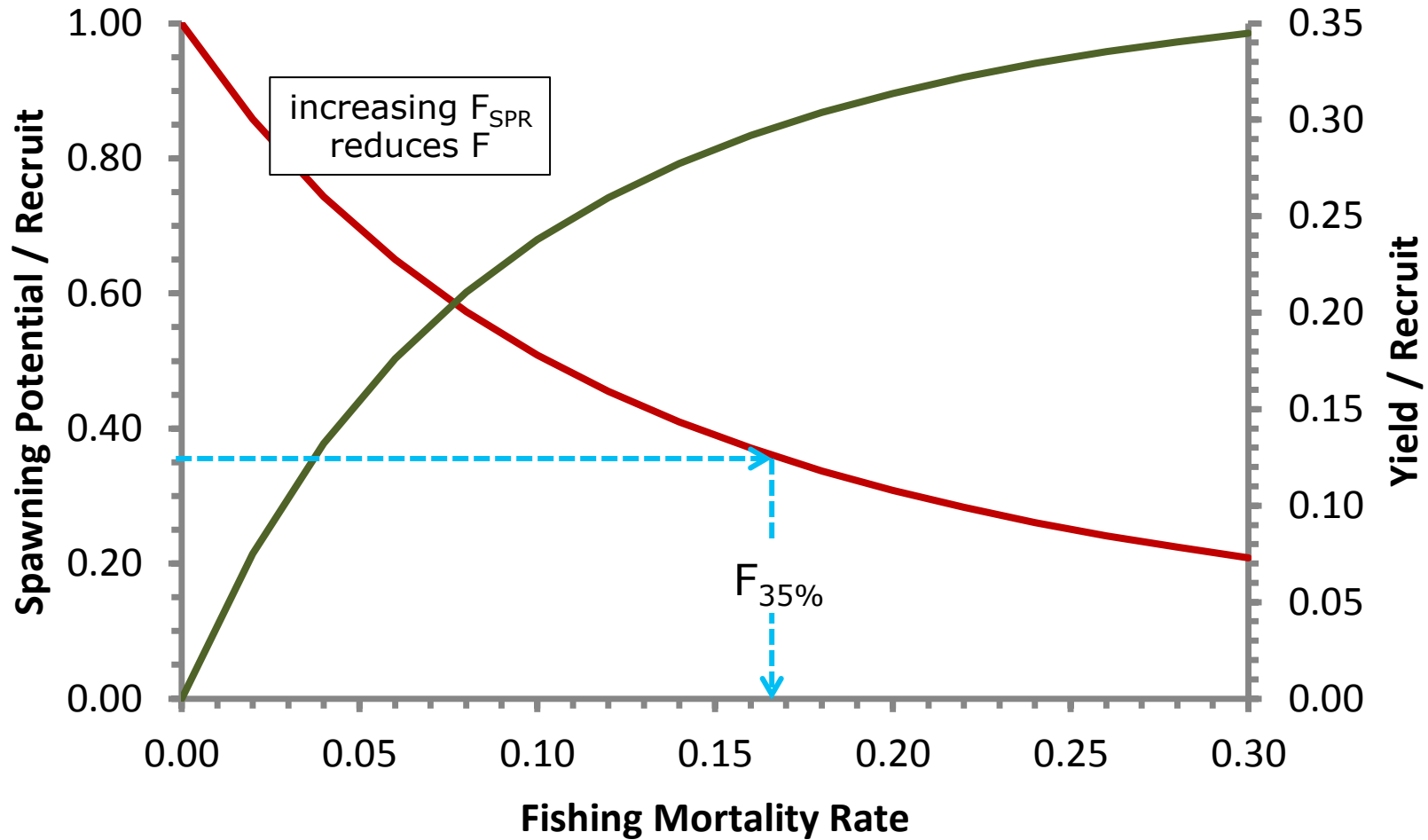
Clark's Seminal Publication Was the Basis of PFMC Harvest Rates During the 1990's

- ❑ Coastwide groundfish surveys began in 1977 and were repeated on a triennial basis
- ❑ Expanded port sampling programs followed the passage of the MSFCMA
- ❑ Due to insufficient data, stock-specific optimal harvest rates could not be estimated
- ❑ Measured *per capita* compensation as ratio of R/S at low stock size relative to R/S at unfished

Initial Range of Productivity Conditions Considered was Broad



Stocks Fished at an $F_{35\%}$ Rate Should Produce a Sustainable Yield of at Least 75% of MSY



Early Groundfish Harvest Policy Was To Fish at a Constant $F_{35\%}$ Rate

- Hightower and Lenarz (1989) recommended a constant harvest rate policy for widow rockfish
- Amendment 5 to the FMP was passed (1990) establishing $F_{20\%}$ as the overfishing rate
- In 1990 the Groundfish Management Team (GMT) and the PFMC adopted $F_{35\%}$ as a proxy for F_{MSY}
- By 1996 concerns had developed

The 1996 Sustainable Fisheries Act (SFA) – A New Reality

- ❑ Amended the MSFCMA to include reference points
 - ❑ Develop target fishing mortality rates (F_{MSY}) and target biomass levels (B_{MSY})
 - ❑ Defined “overfishing” ($F > F_{MSY}$)
 - ❑ Established conditions for declaring a stock “overfished” ($B < 0.5 B_{MSY}$)
 - ❑ Determined requirements for rebuilding overfished stocks
 - ❑ Required identification of Essential Fish Habitat (EFH)
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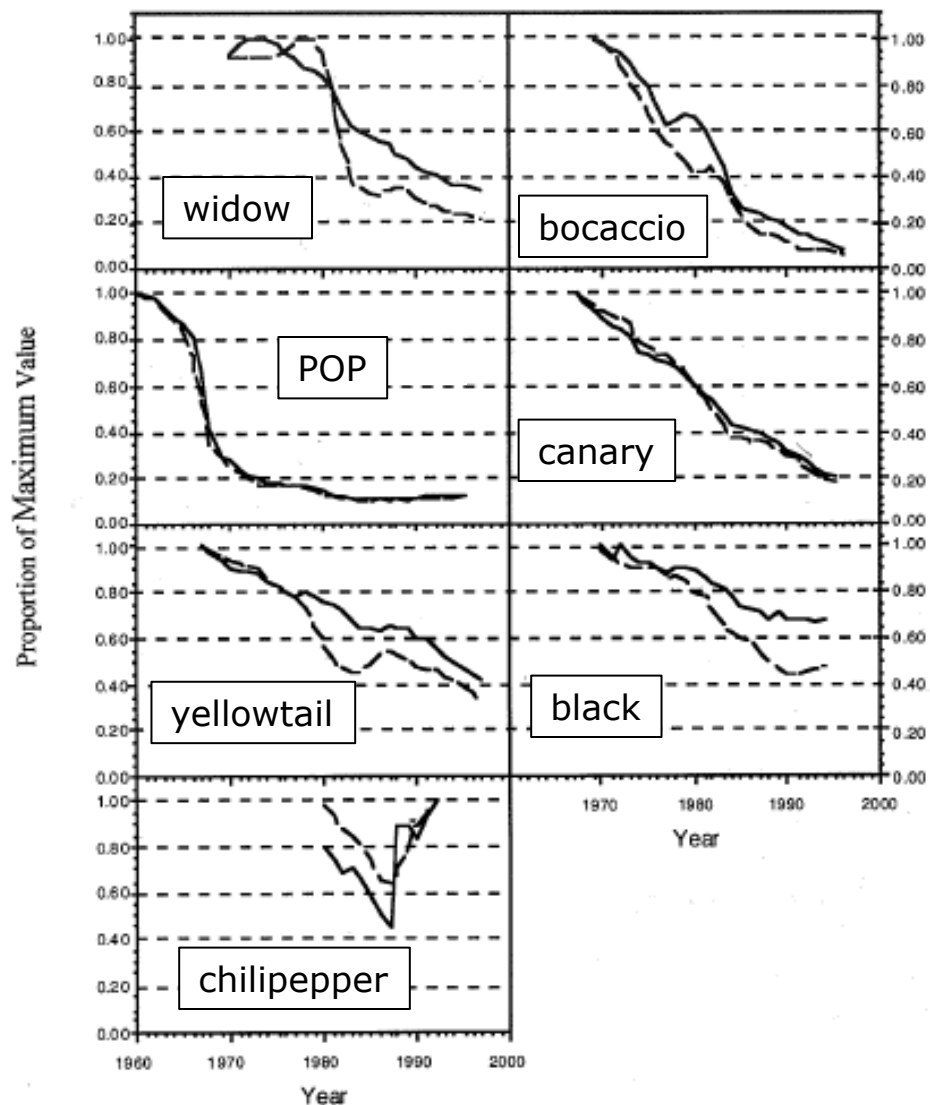


Figure 1. Trends in exploitable biomass (solid lines) and spawning output (dashed lines) for seven west coast rockfish stocks.

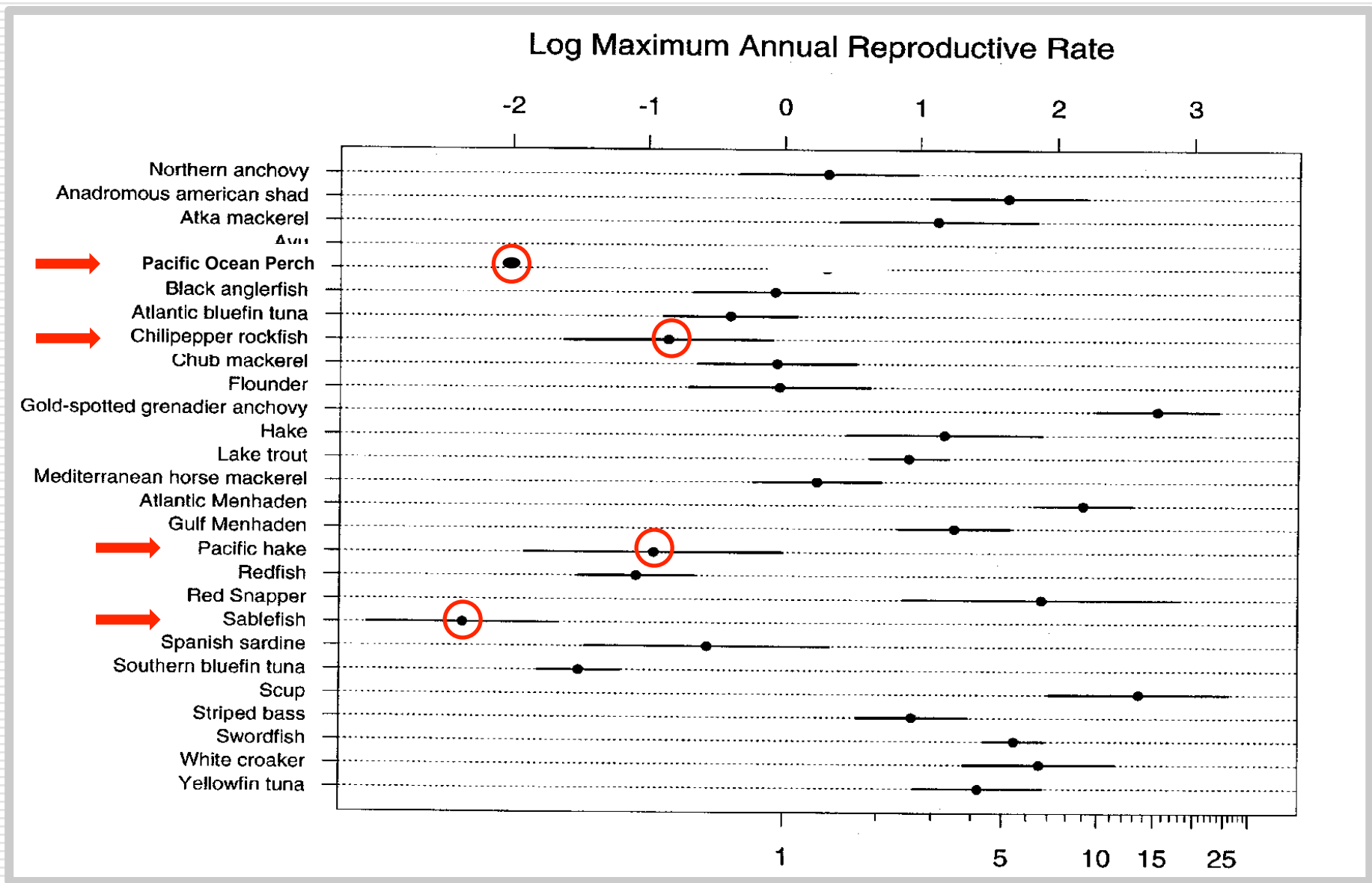
In 1998 the rockfish harvest rate was reduced to $F_{40\%}$ because some stocks were not approaching an equilibrium

The Council decided to convene a Harvest Policy Workshop in 2000



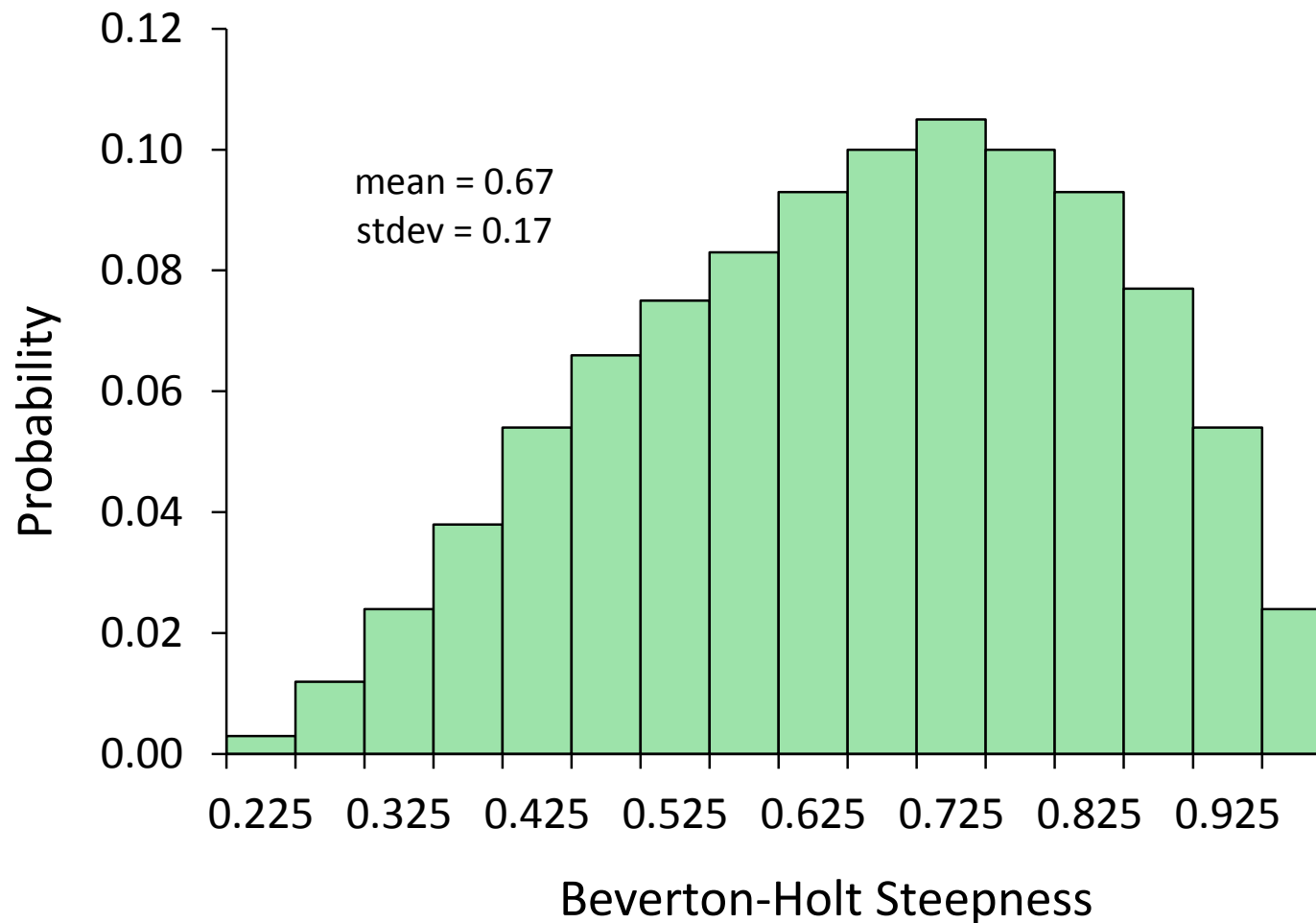
Ralston, S. 1998. The status of federally managed rockfish on the U.S. west coast, pp. 6-16. In: M. M. Yoklavich (ed.), Marine Harvest Refugia For West Coast Rockfish: a Workshop. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-255.

West Coast Groundfish Exhibit Low Productivity



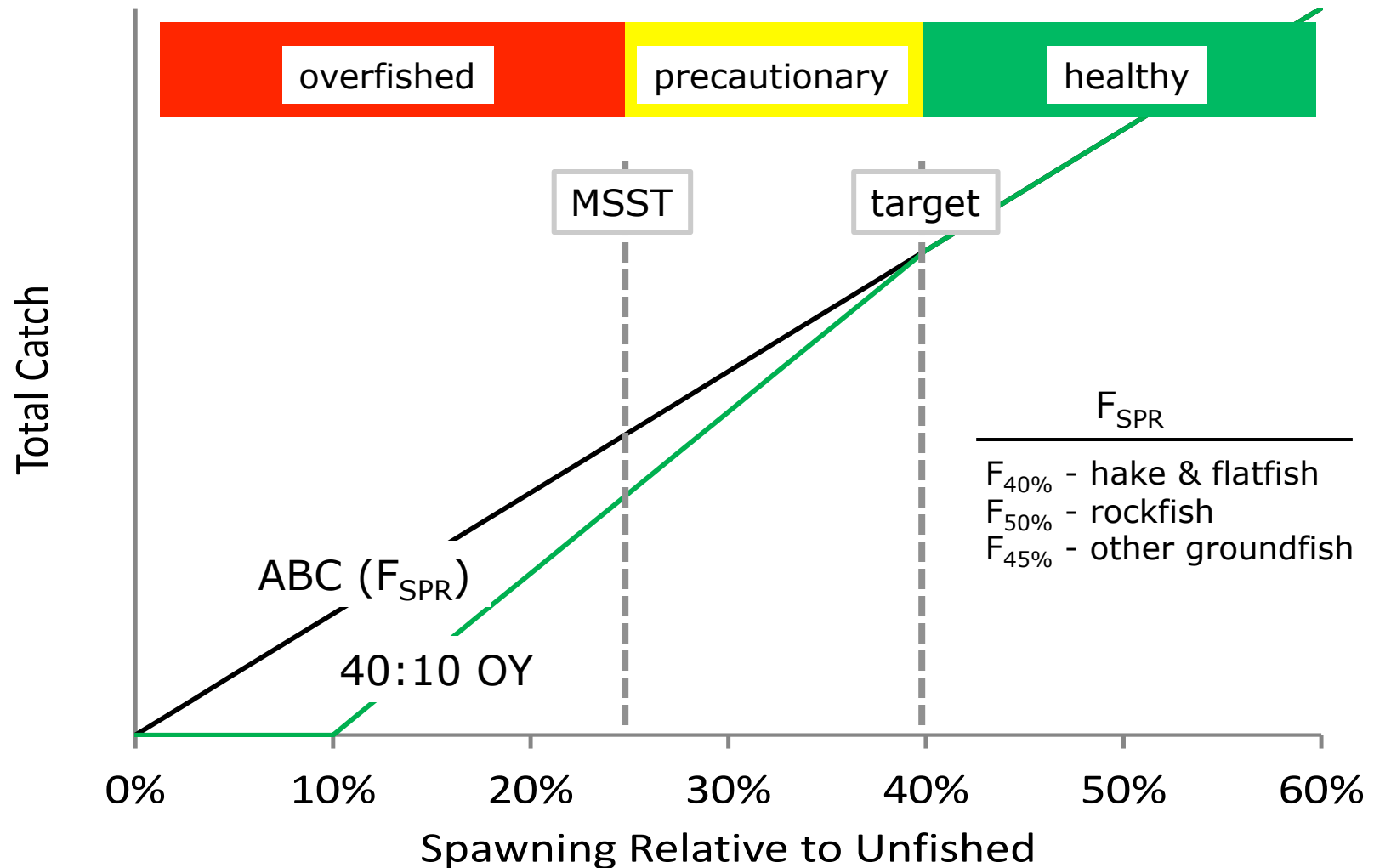
Myers, RA, KG Bowen, and NJ Barrowman. 1999. Maximum reproductive rate of fish at low population size. *Can. J. Fish. Aquat. Sci.* 56:2404-2419.

A Bayesian Prior Probability of Rockfish Productivity Was Estimated

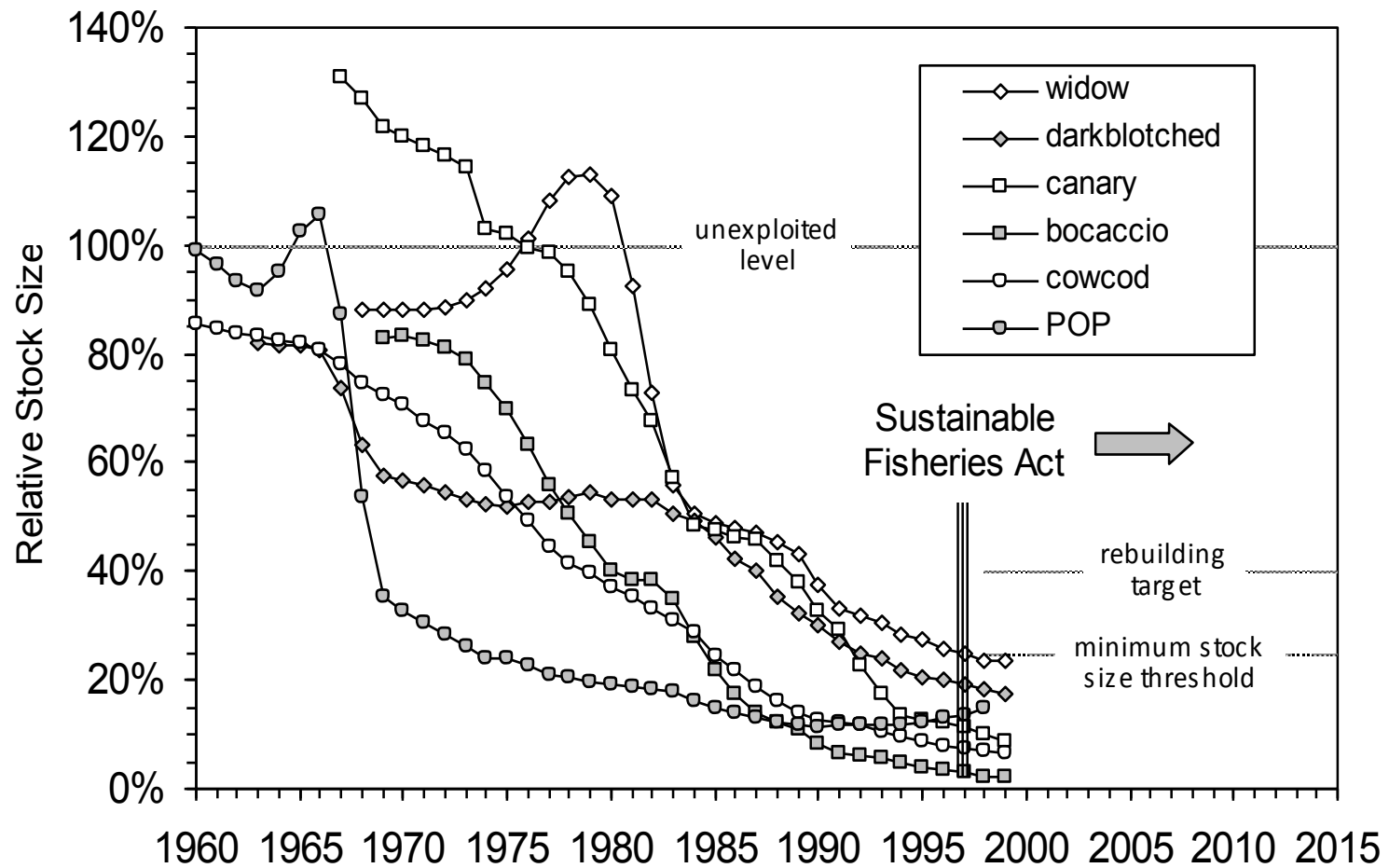


Dorn, M.W. 2002. Advice on west coast rockfish harvest rates from Bayesian meta-analysis of stock-recruit relationships. *N. Amer. J. Fish. Manag.* 22:280-300.

Groundfish Harvest Policy was Revised to Incorporate a Minimum Stock Size Threshold (MSST) and Precautionary Catch Reductions



Houston – we have a problem...



PFMC Actions Directed Towards Rebuilding Overfished Stocks

- Develop rebuilding plans
- Reduce trip limits
- Limited entry permit buyback
- Rockfish Conservation Area (RCA)
- Trawl footrope restrictions
- Streamline management cycle

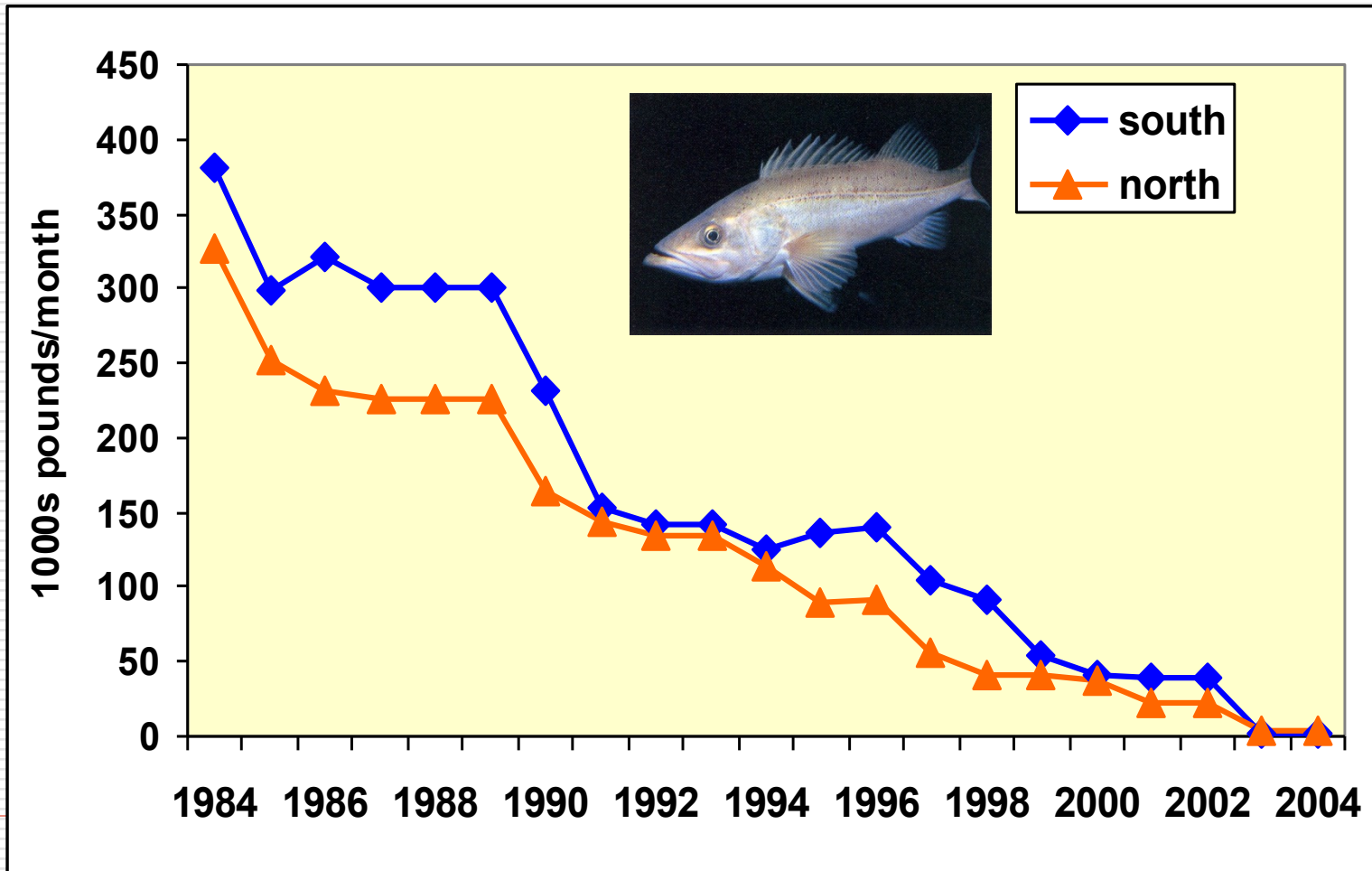


Different Stocks Had Different Rebuilding Criteria Applied

Stock	P_{rebuild} by T_{max}
<input type="checkbox"/> Bocaccio	70%
<input type="checkbox"/> Canary Rockfish	60%
<input type="checkbox"/> Widow Rockfish	60%
<input type="checkbox"/> Pacific Ocean Perch	70%
<input type="checkbox"/> Darkblotched Rockfish	>90%
<input type="checkbox"/> Yelloweye Rockfish	92%
<input type="checkbox"/> Cowcod	60%
<input type="checkbox"/> Lingcod	60%

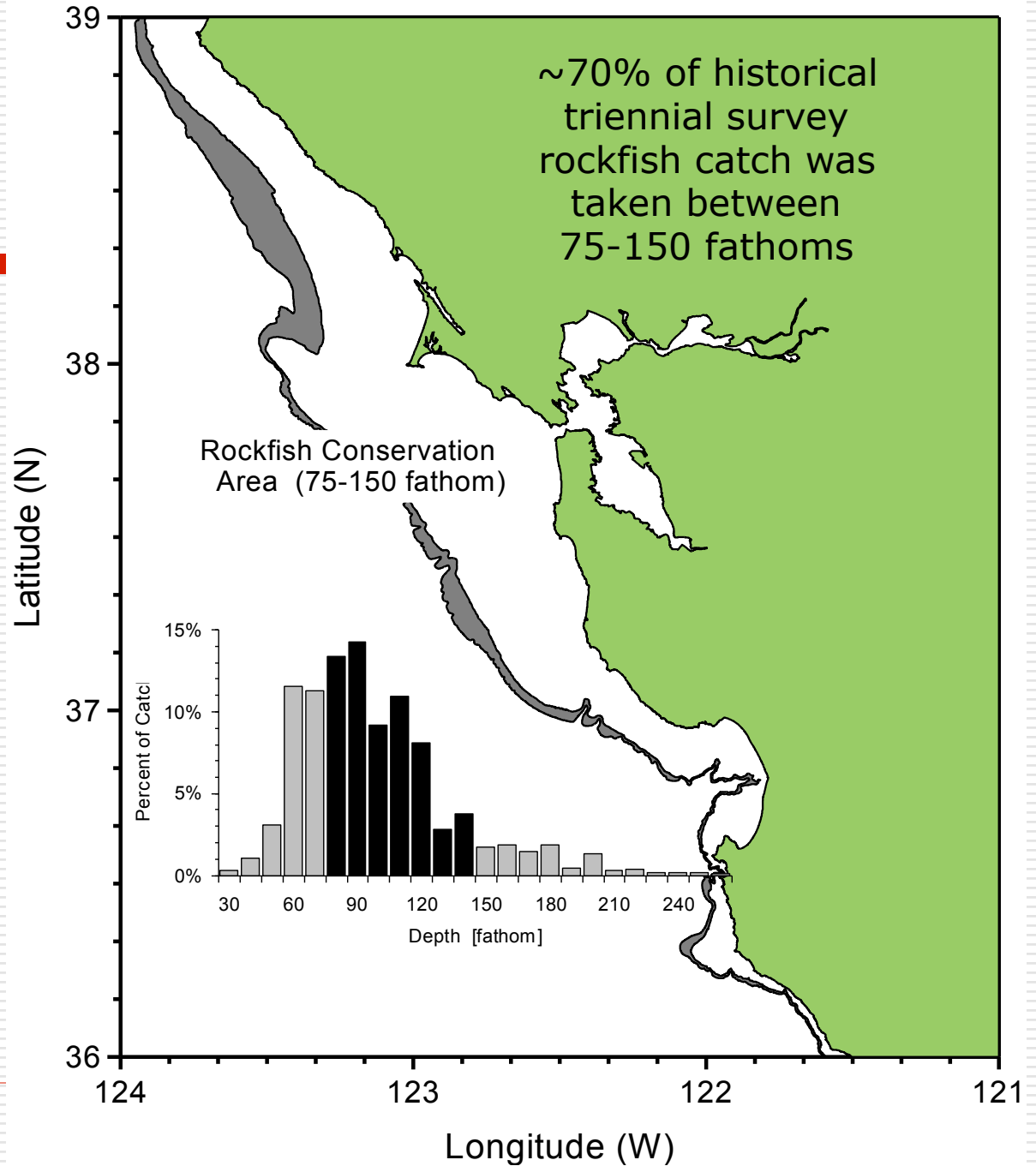
Punt, A. E., and S. Ralston. 2007. A management strategy evaluation of rebuilding revision rules for overfished rockfish stocks, pp. 329-351. In: Proc. of the 2005 Lowell Wakefield Symposium, Biology, Assessment, and Management of North Pacific Rockfishes, Alaska Sea Grant College Program, AK-SG-07-01, University of Alaska, Fairbanks, AK.

To Meet the Required Catch Reductions Groundfish "Trip Limits" Were Reduced



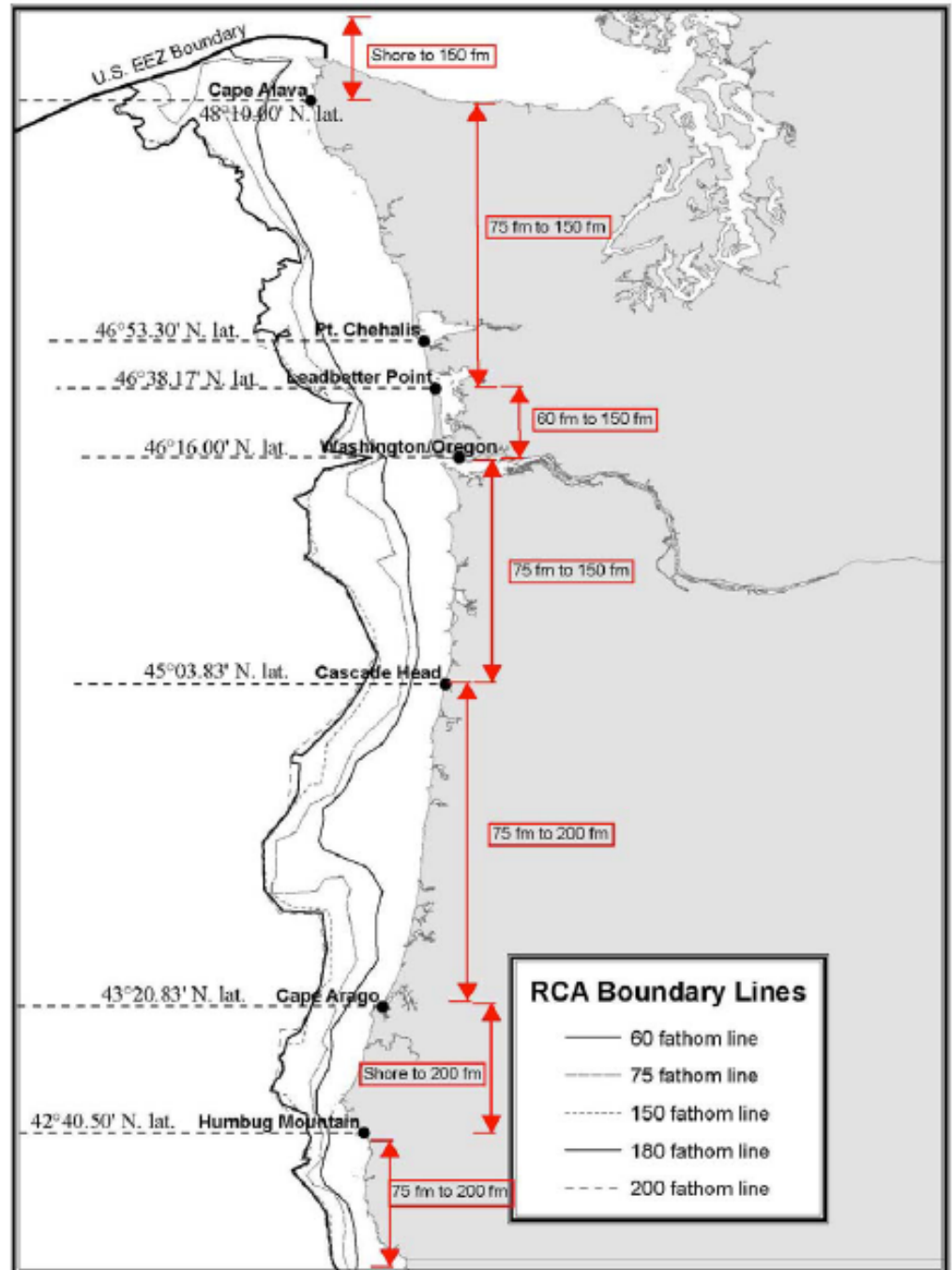
Rockfish Conservation Area

RCA is a narrow spatial band, but is highly effective at protecting the majority of overfished rockfish biomass

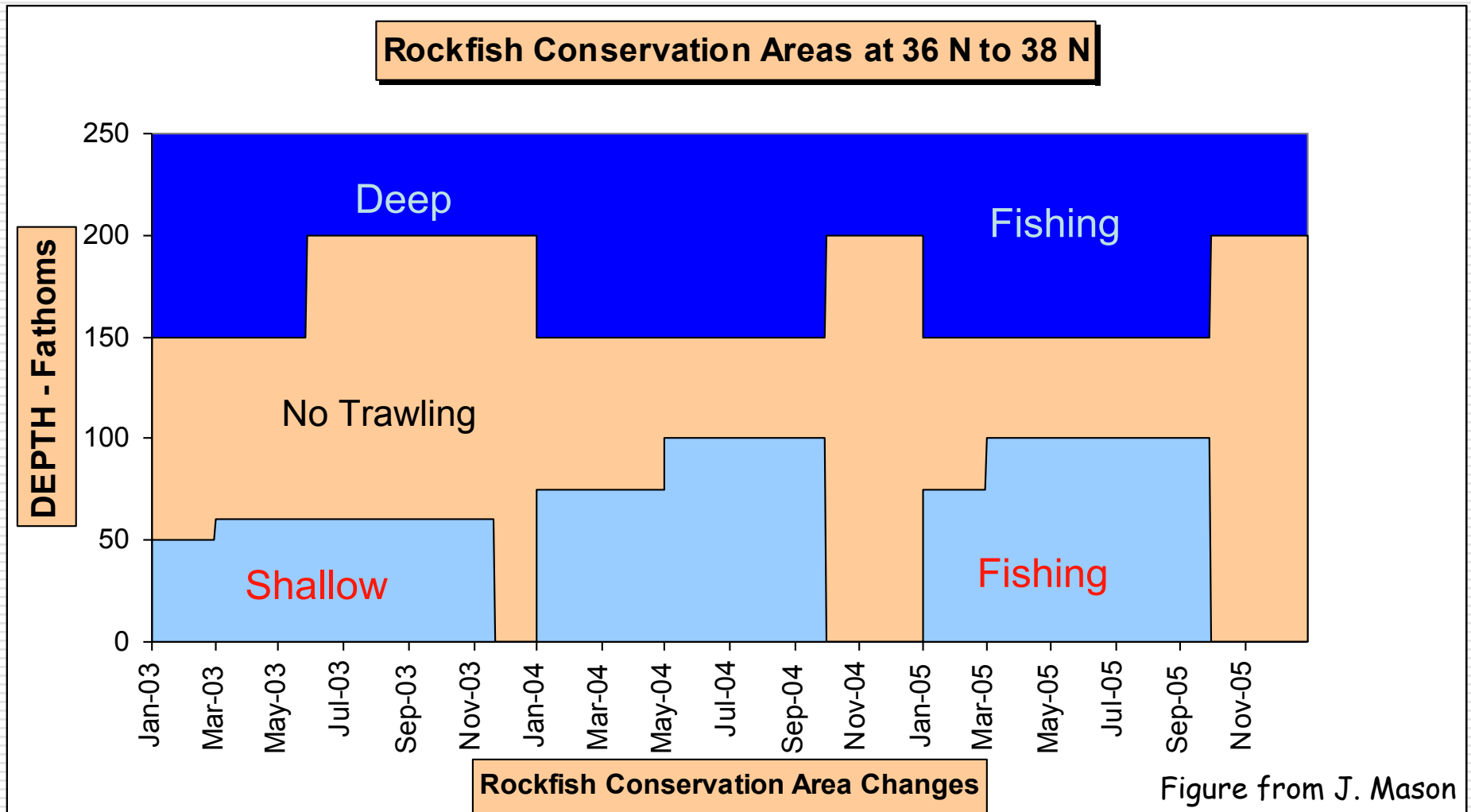


The RCA Became Latitudinally Stratified To Maximize Opportunities To Provide Access to Healthy Stocks

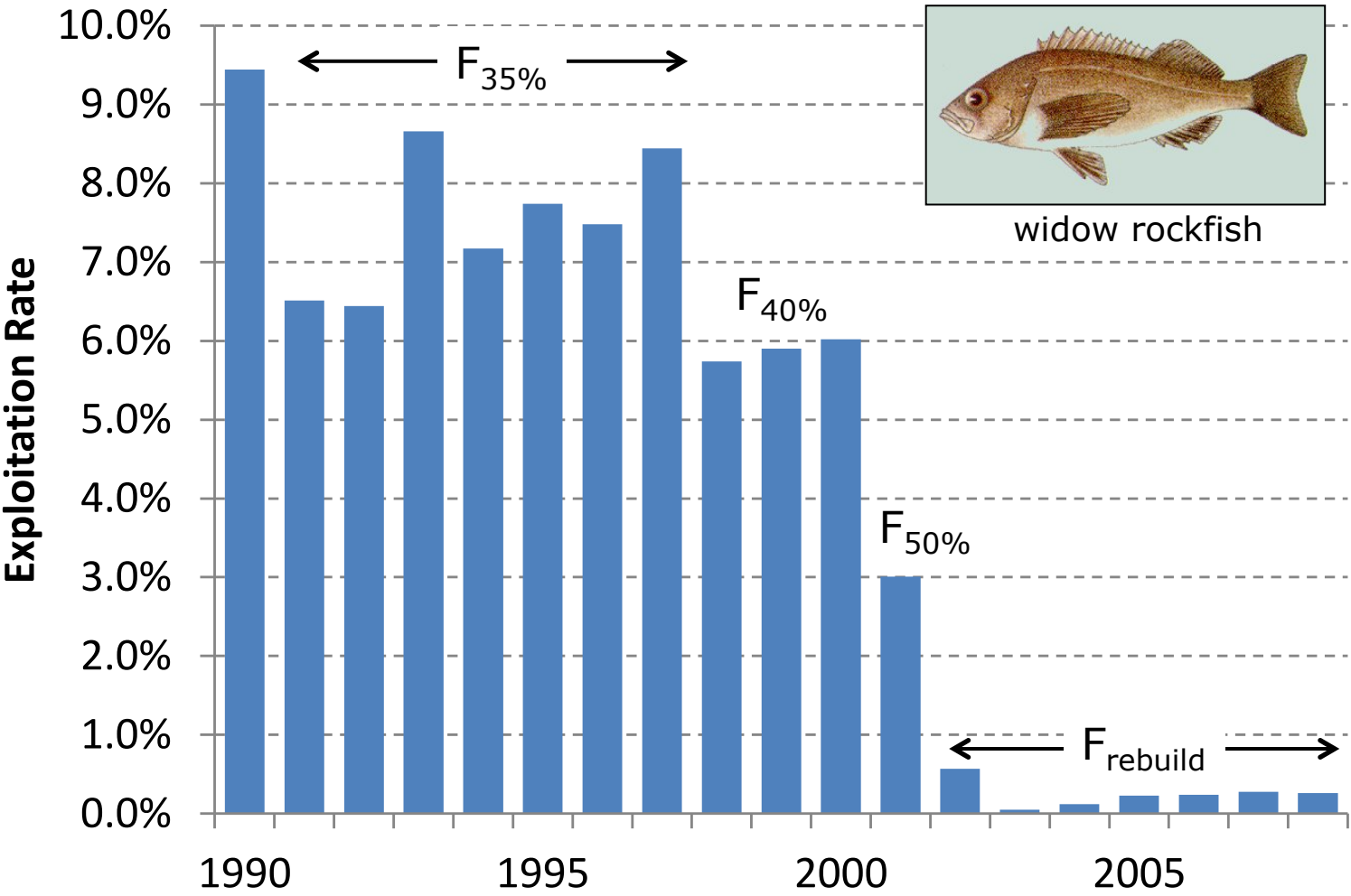
GMT report, March 2007



The RCA Also Became Temporally Stratified for the Same Reason



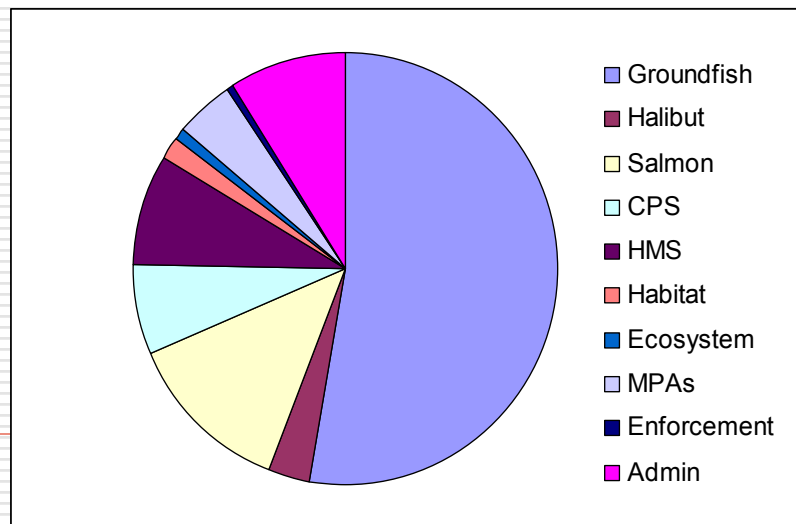
Exploitation Rates of Rebuilding Species Were Sharply Reduced



Xi et al. 2009

Groundfish Science and Management Practices Were Revised

- Stock Assessment Review (STAR) process implemented 1997
 - Greater public participation
 - Improve quality and rigor of scientific review
 - Created a “Wall of Science”
- Amendment 17 to the FMP (2003) moved groundfish management to a multi-year cycle (on year – off year)



PFMC Agenda Time
(April 2009–March 2010)

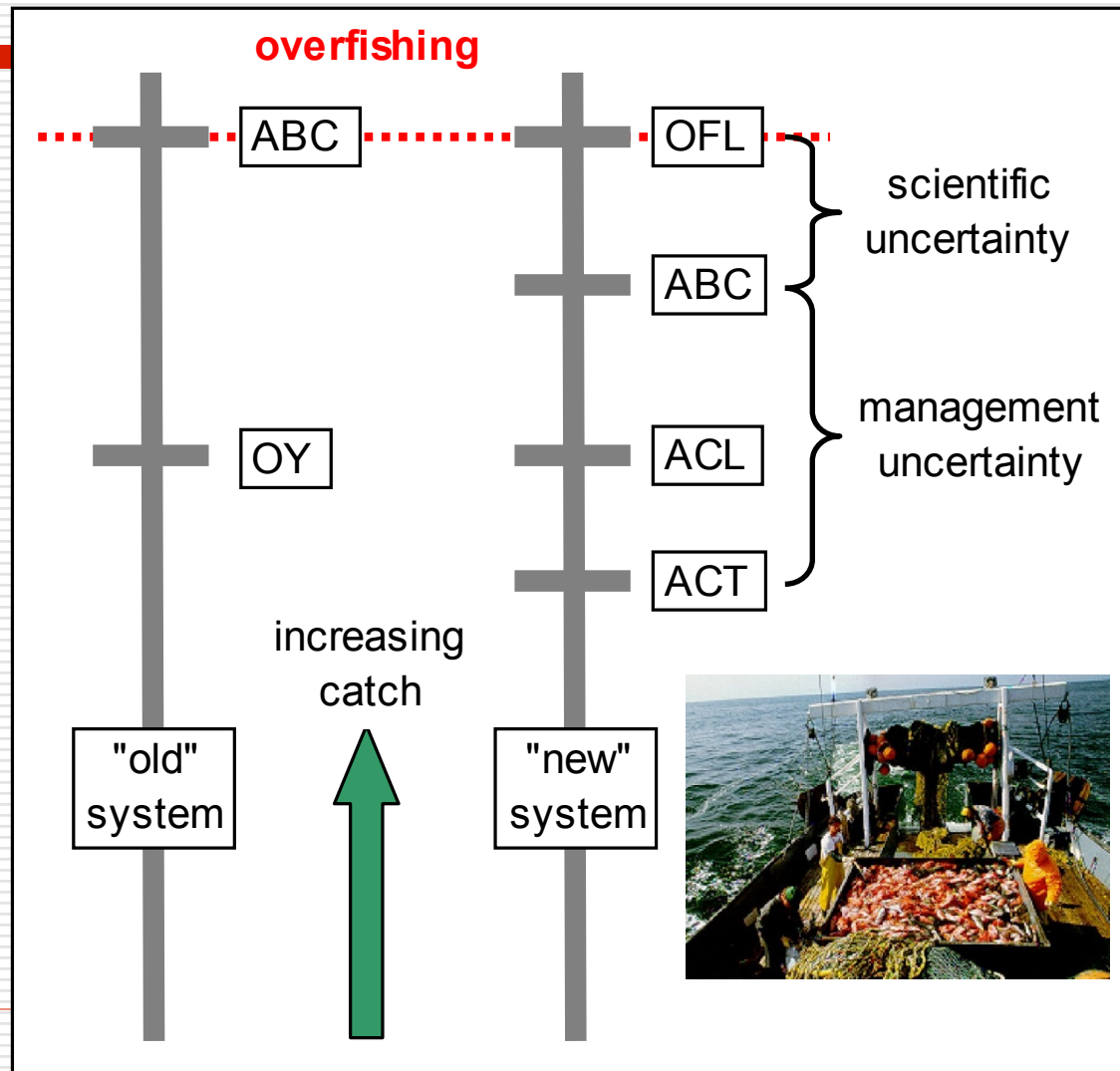
Some Key Mandates of the Magnuson-Stevens Reauthorization Act (MSRA) of 2006

- ❑ End overfishing of **all** managed stocks using ACLs
 - ❑ Use Accountability Measures (AMs) to insure ACLs are not exceeded
 - ❑ Council SSCs determine scientific uncertainty in the development of precautionary buffers
 - ❑ Established conditions for implementation of catch share programs
 - ❑ Effectuated in FMP Amendment 23 (2010)
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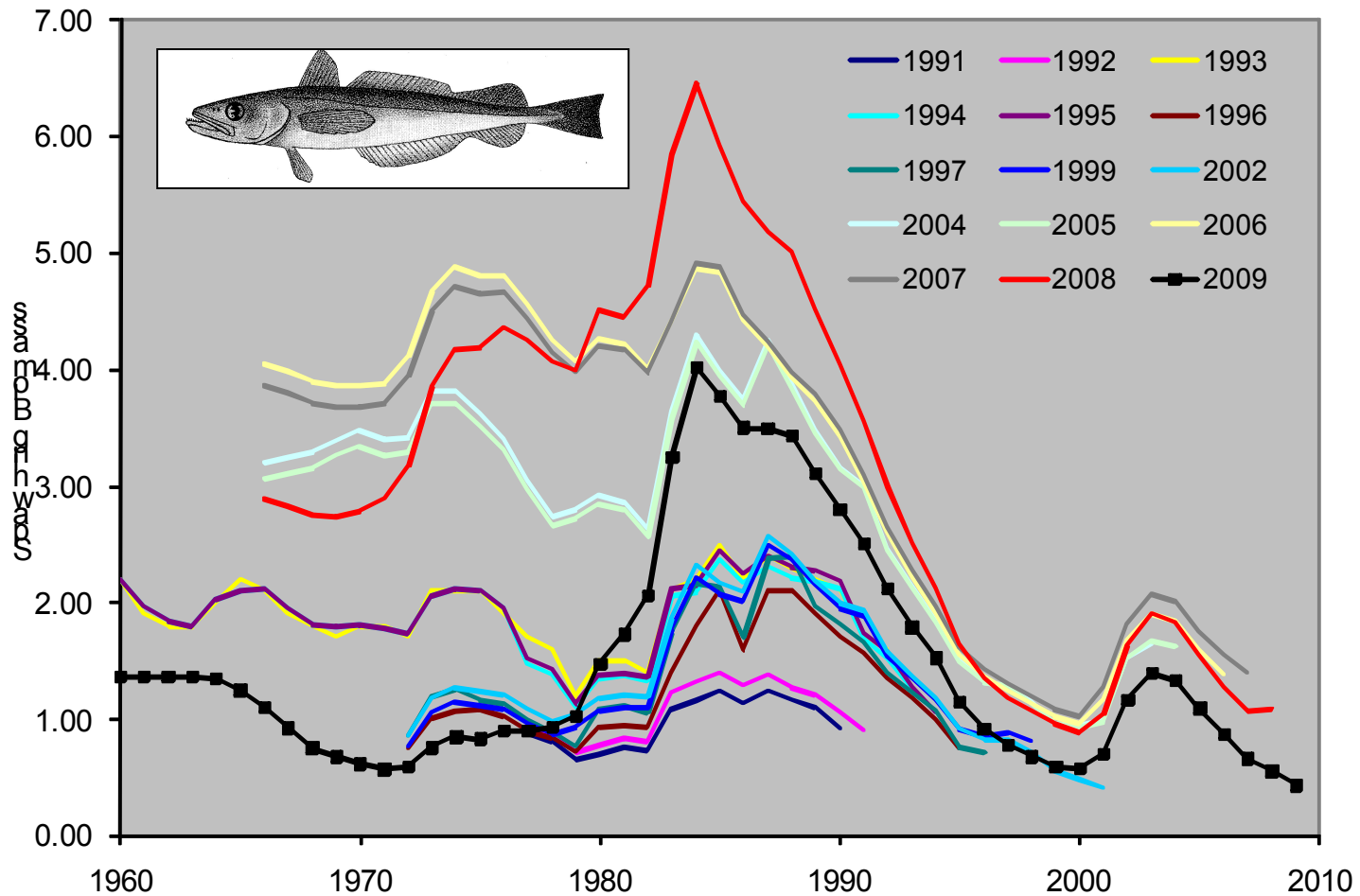
Some New Definitions of Terms

ACLs should not be exceeded more than once in four years.

In-season monitoring of landings & discards to insure an ACL is not exceeded is a suitable accountability measure.



How to Define and Quantify Scientific Uncertainty?



Pooled Variation Over All Groundfish

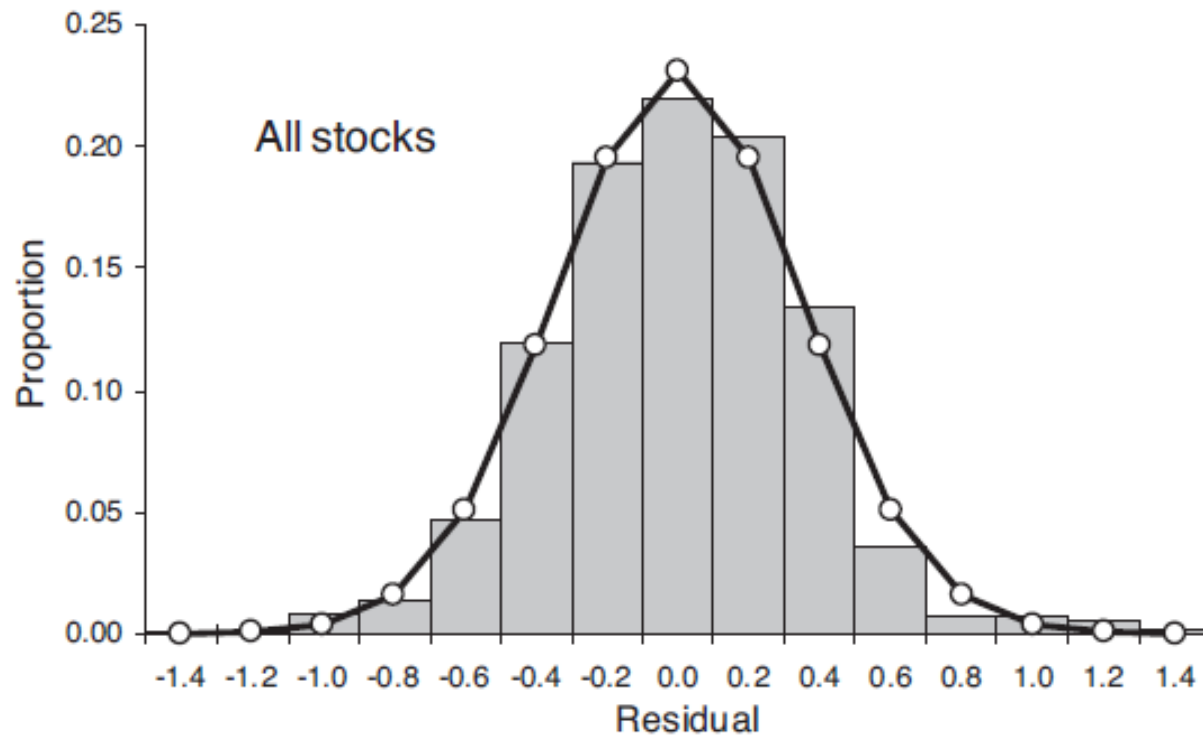
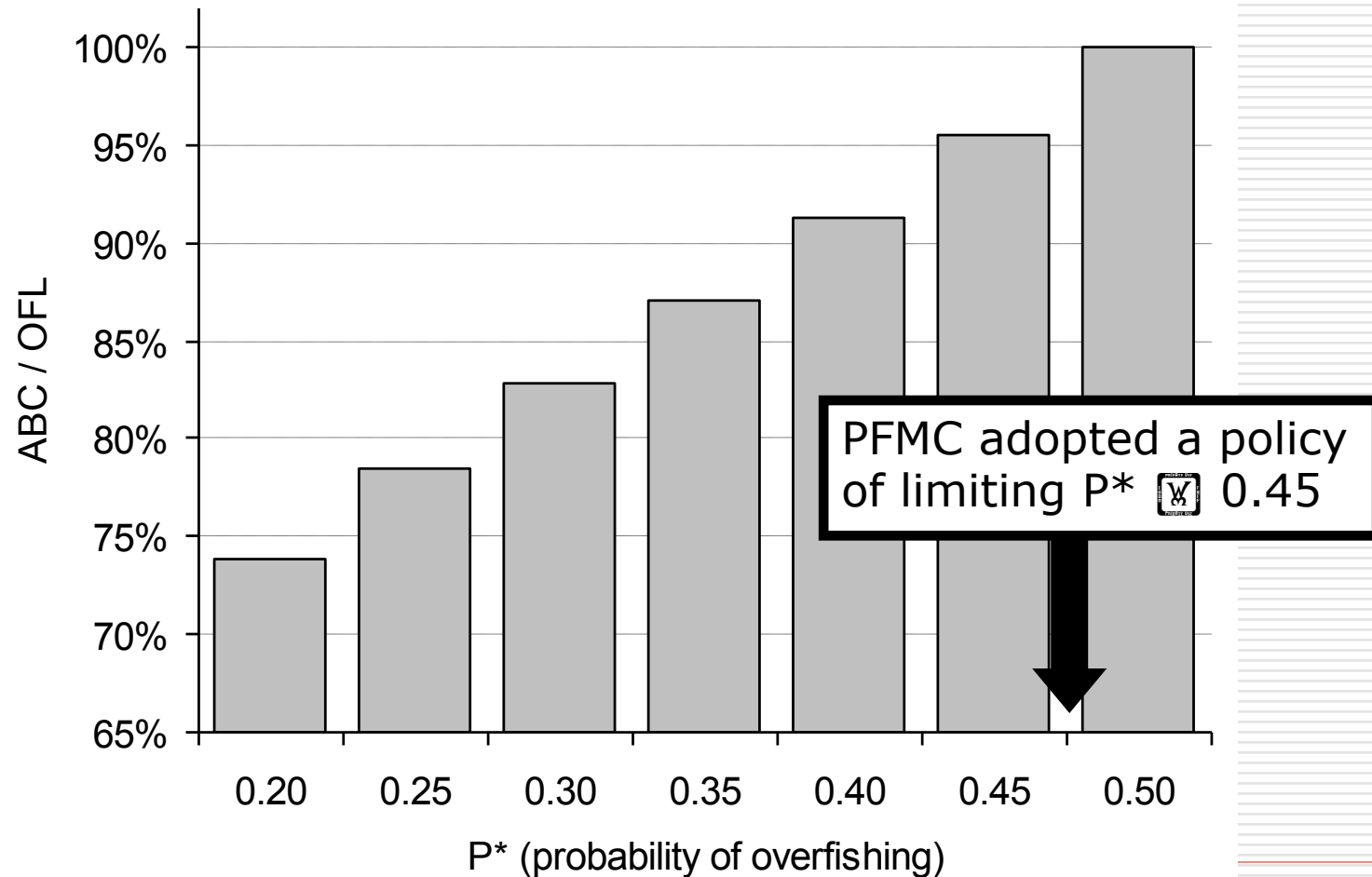


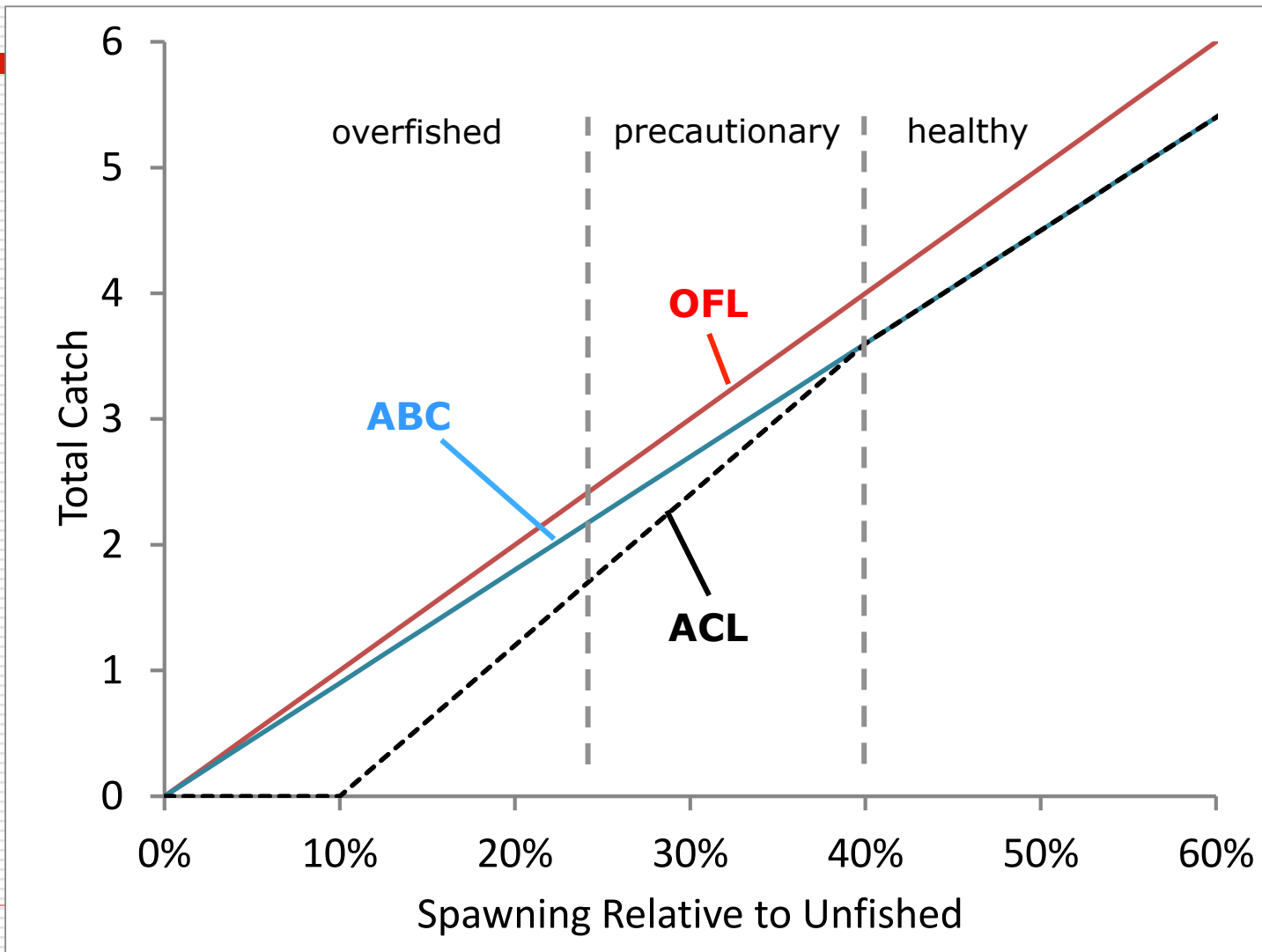
Figure 6

Aggregate distribution of log-deviations pooled over all 17 stocks with the fit of a normal distribution shown as the line with symbols ($\sigma = 0.36$).

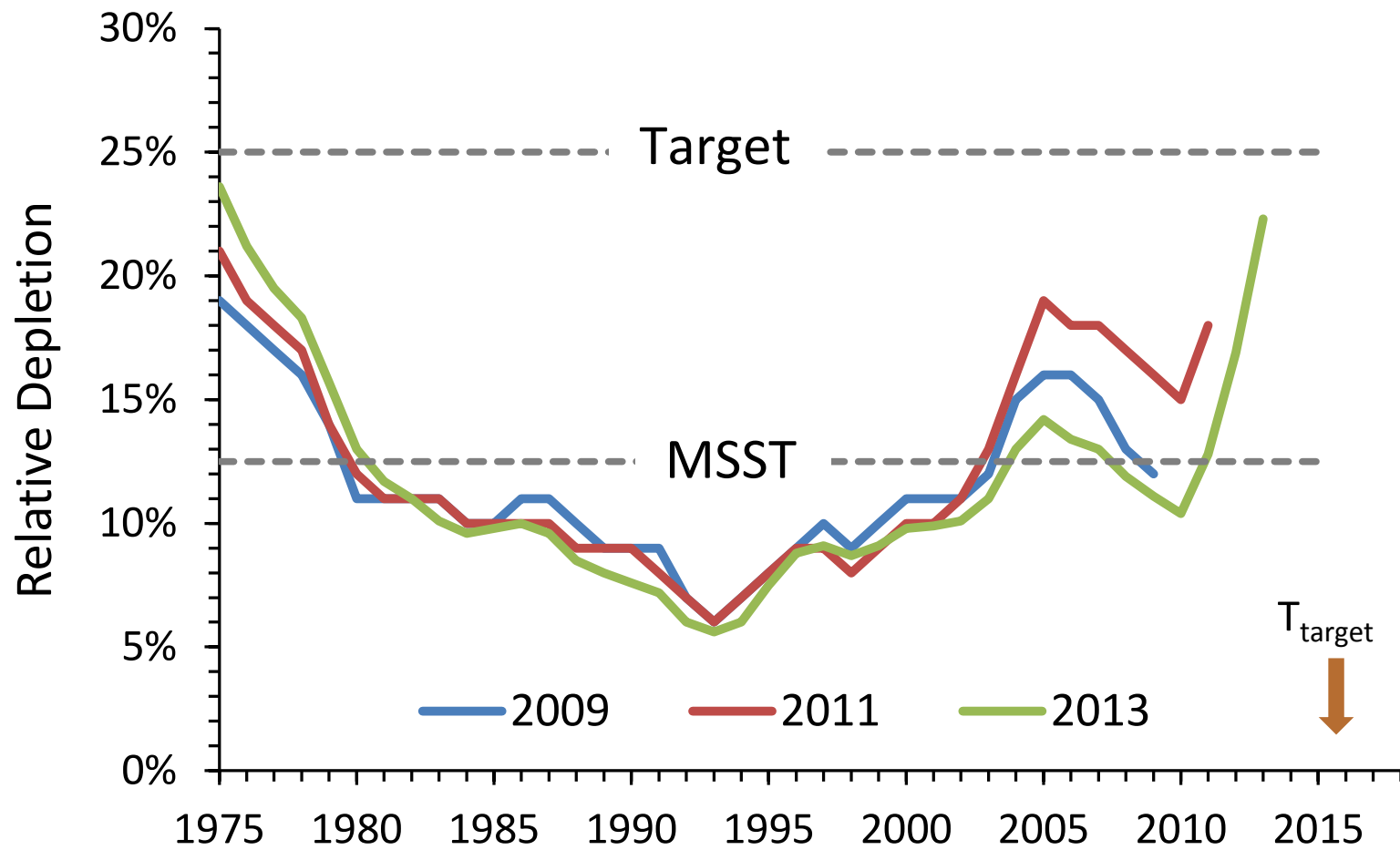
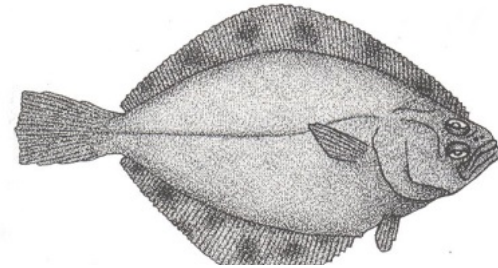
The ABC Control Rule Used by the PFMC for Data-Rich Tier 1 Stocks



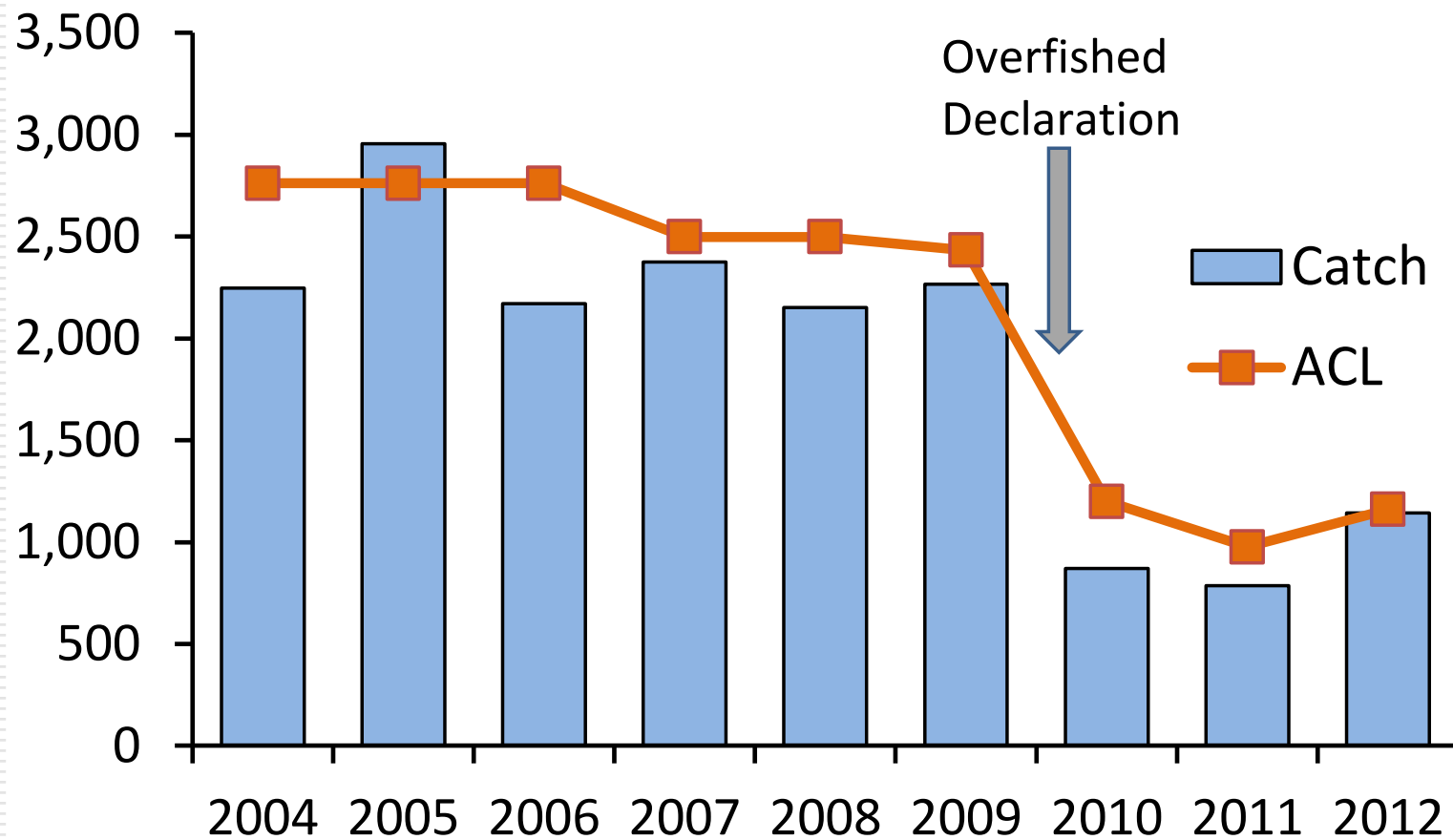
Revised 40:10 Harvest Policy Incorporates a "Scientific Uncertainty" Buffer



Petrale Sole – A New Casualty



Petrale Sole Rebuilding Follows the PFMC's Default Flatfish Harvest Policy



Improving on Restrepo *et al.* – Developing ACLs for All Groundfish Stocks

- Depletion-Based Stock Reduction Analysis (Dick & MacCall 2010) applied to 40+ stocks during the 2011-2012 cycle
 - Requires complete historical catch reconstructions
 - OFL estimates aggregated into stock complexes

- Extended DBSRA and extended Simple Stock Synthesis applied to stocks in the 2013-2014 cycle
 - Models include CPUE time series and priors
 - Stock status is informed by data (Tier-2)
 - Greater throughput (6 stock assessments from 1 STAR panel)

Trawl Rationalization: Limited Access Privileges And Trawl Individual Quotas (TIQ)

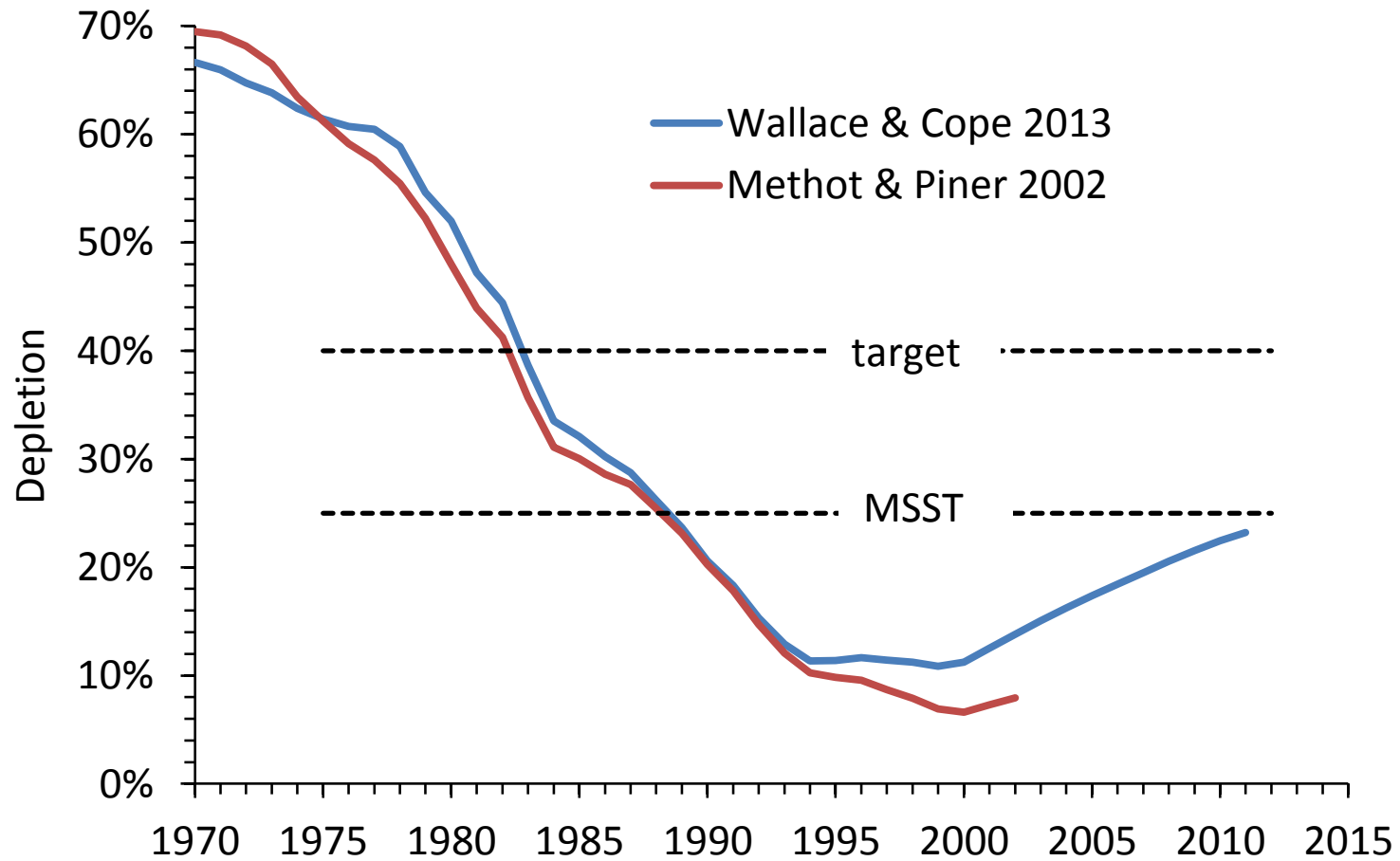
The Problem

- ❑ “Groundfish Disaster” – rockfish stocks declared overfished
- ❑ Minimizing bycatch of overfished stocks creates economic losses due to foregone harvest opportunity
- ❑ Unknown discard of overfished stocks

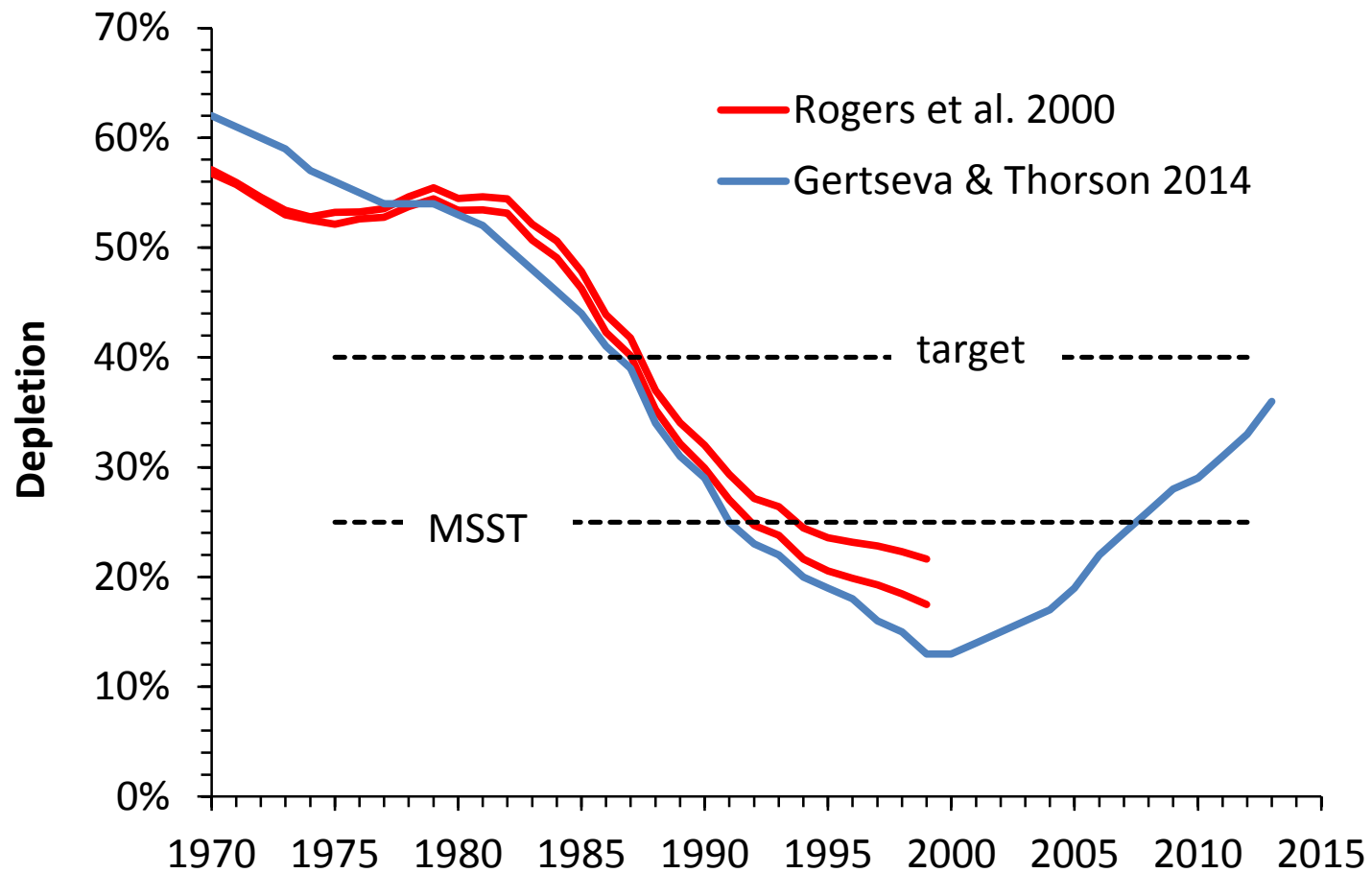
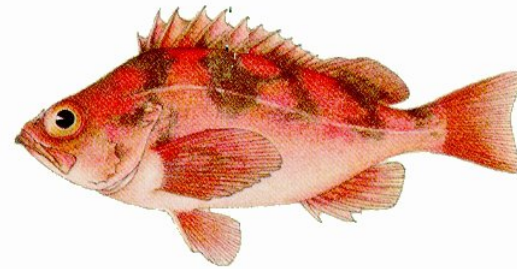
The Solution: Catch Shares

- ❑ Allocate a portion of ACL based on historic participation
- ❑ Species-specific quota shares (e.g., depleted rockfish)
- ❑ Gives share holders flexibility when to harvest
- ❑ Holders can transfer annual “quota pound” allotment
- ❑ FMP Amendment 20 passed in June 2010
- ❑ 100% observer coverage, which is costly
- ❑ Pools established to spread risk of catch overages

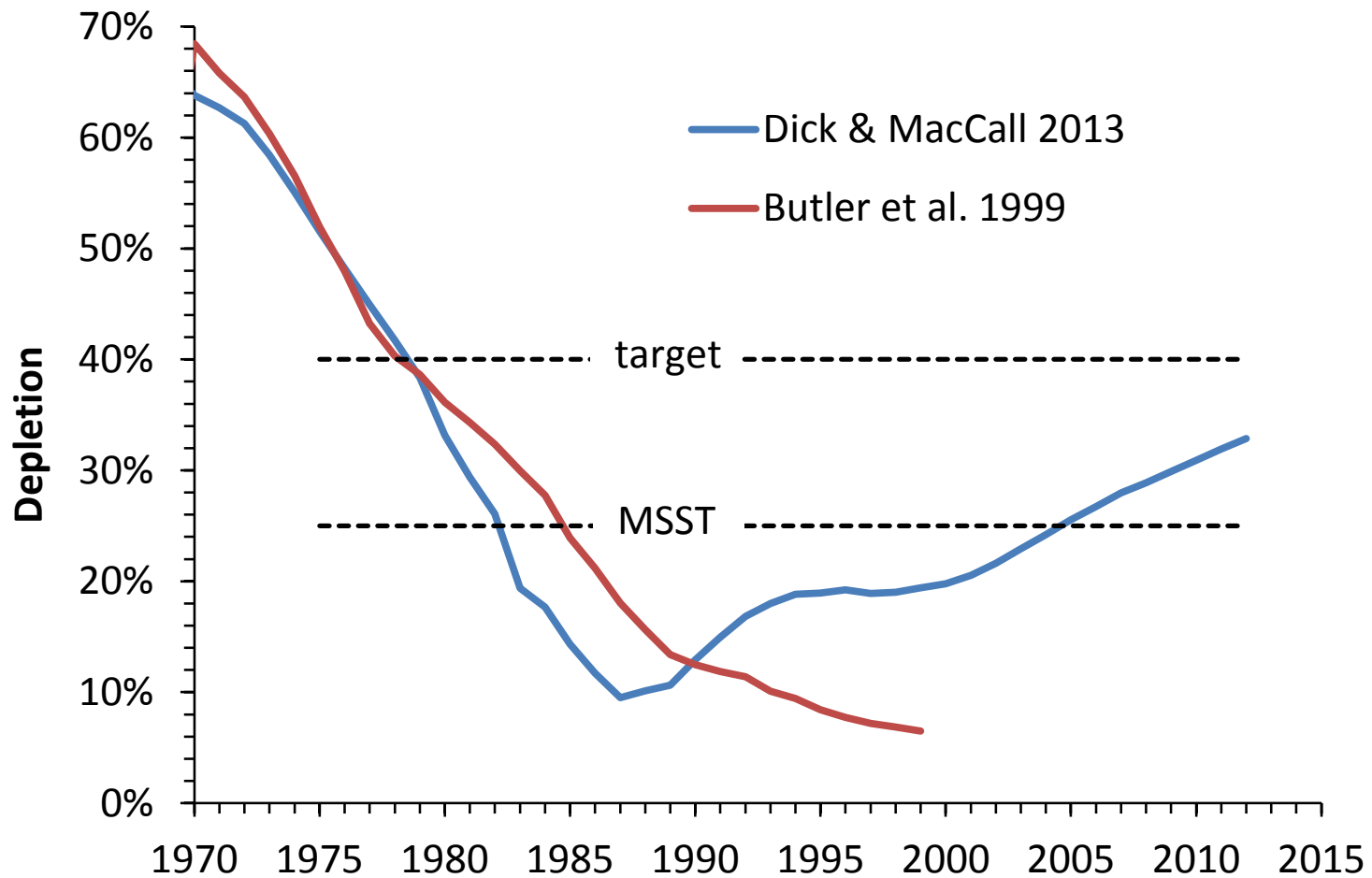
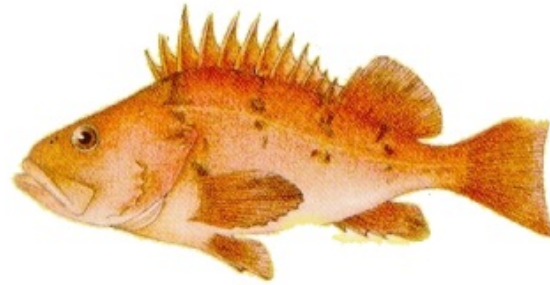
Canary Rockfish



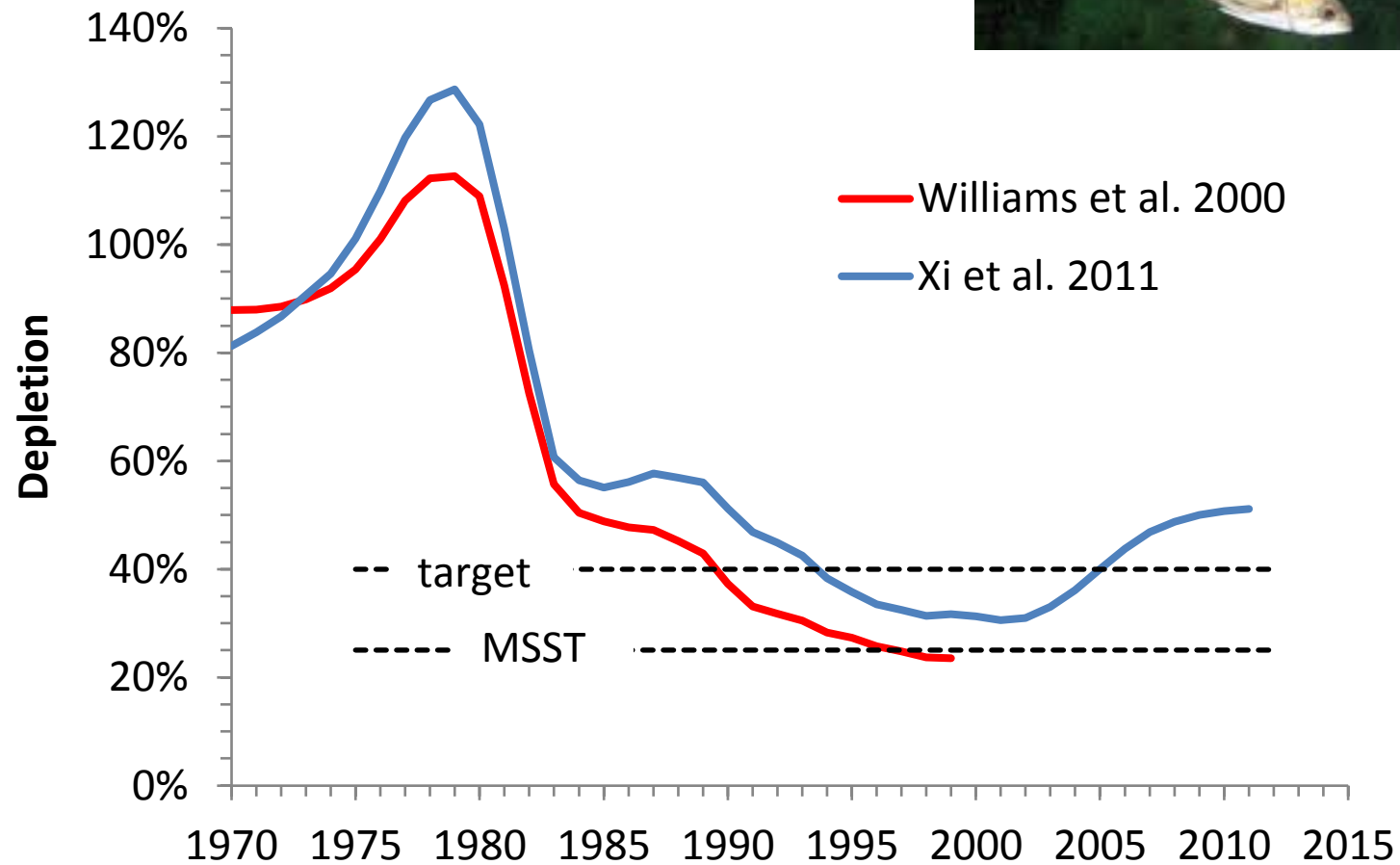
Darkblotched Rockfish



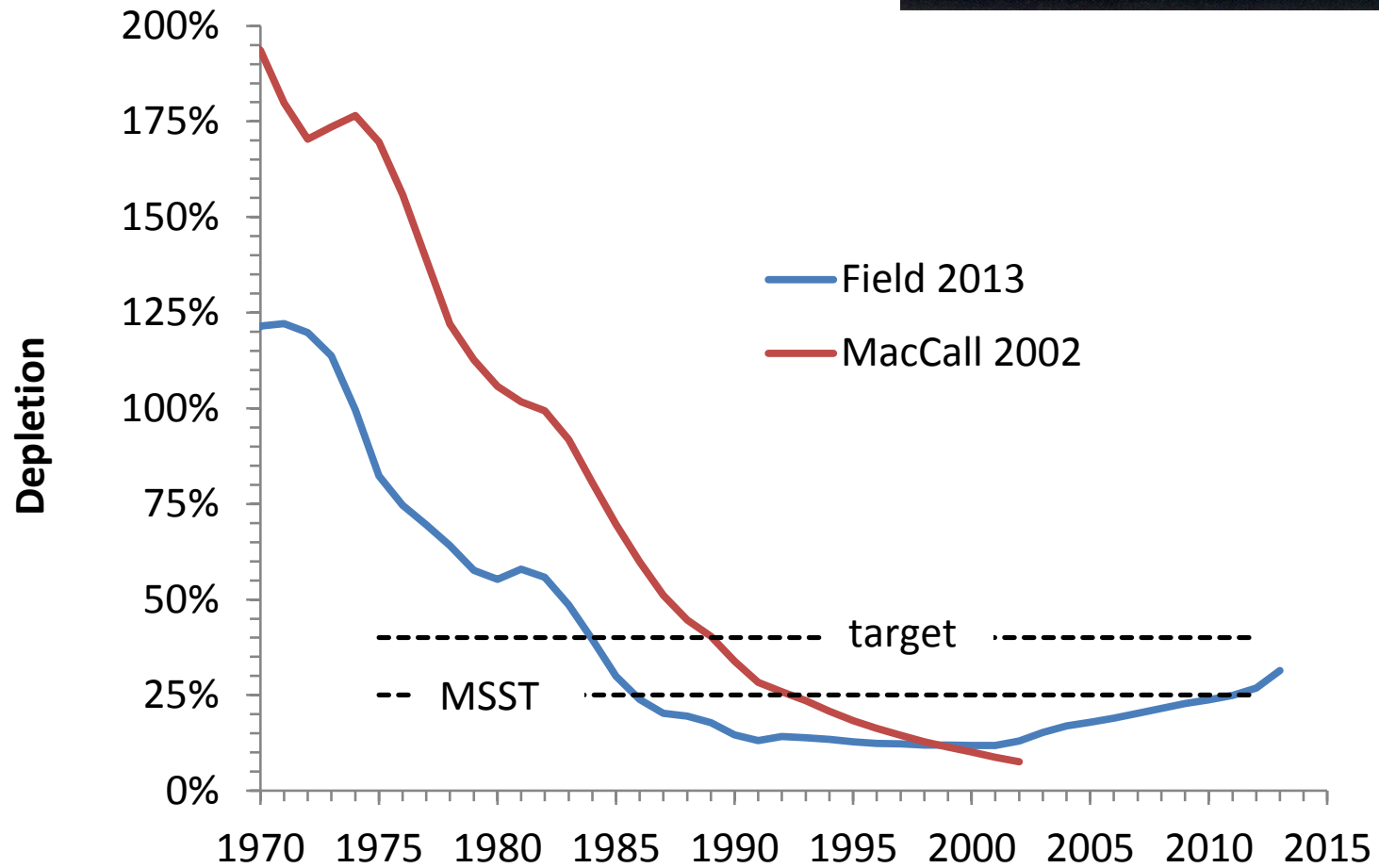
Cowcod



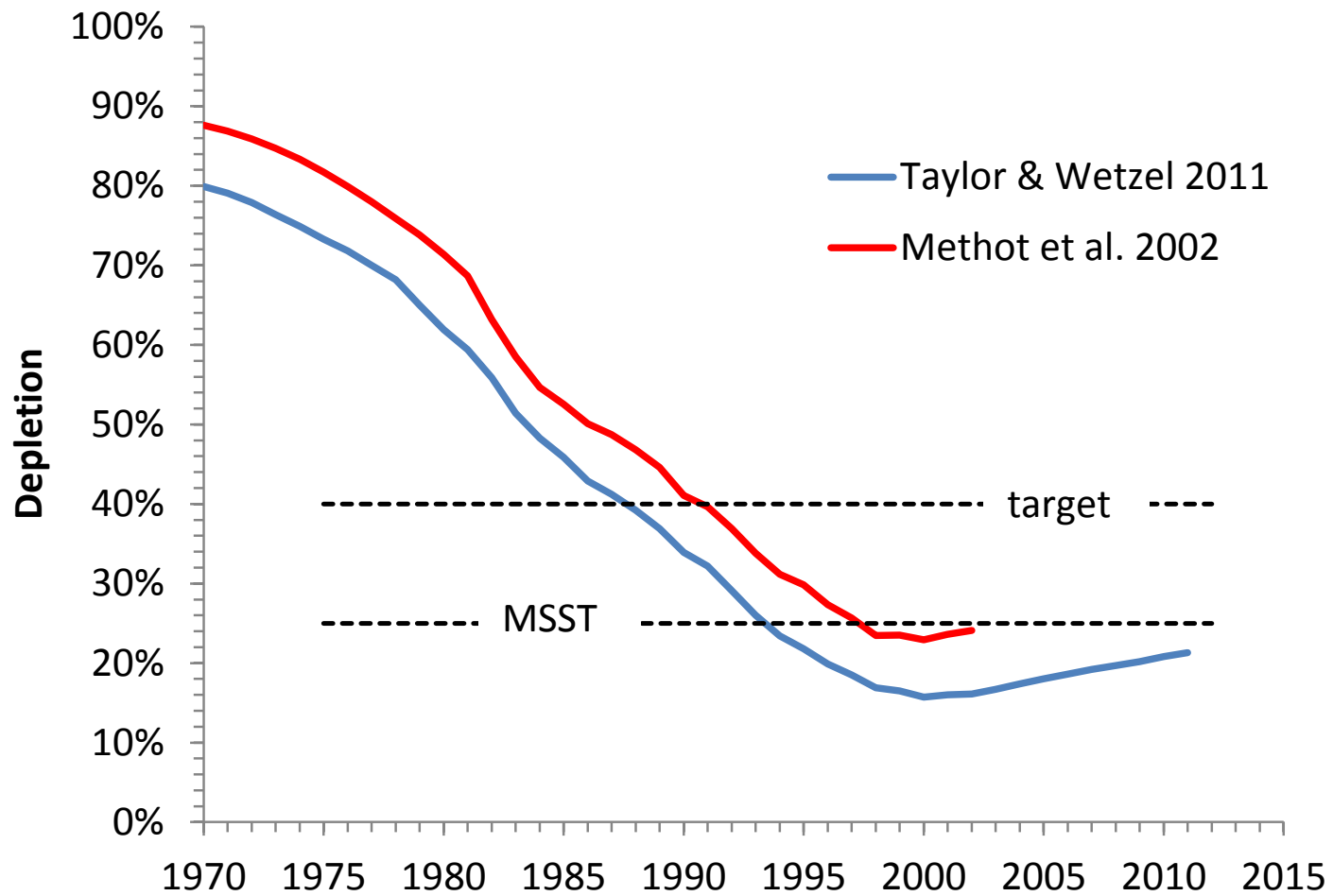
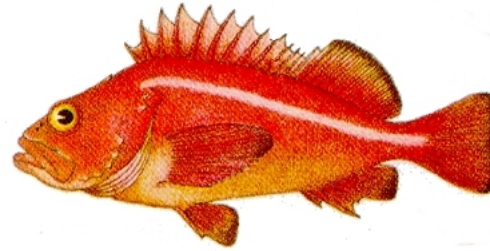
Widow Rockfish



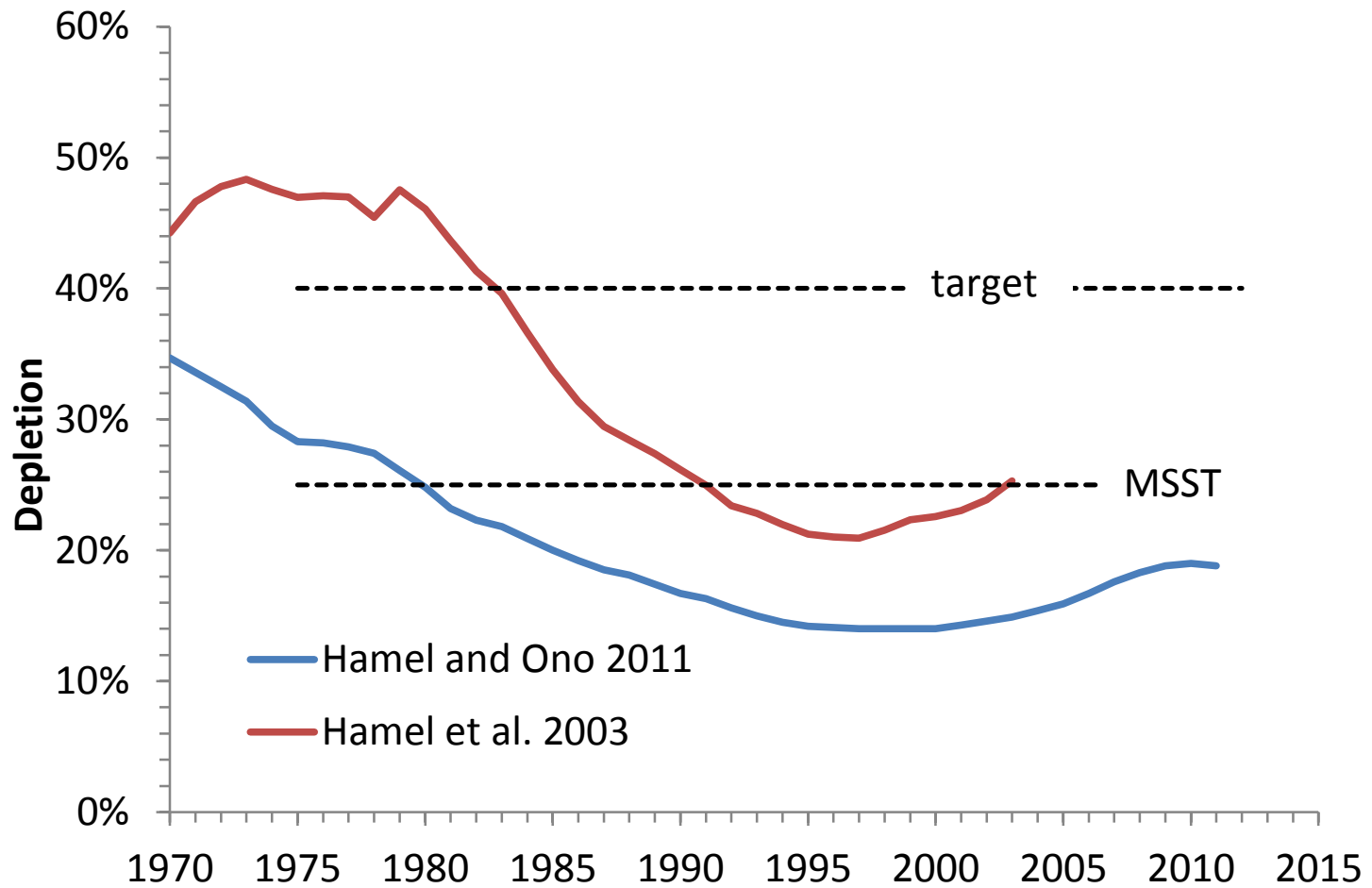
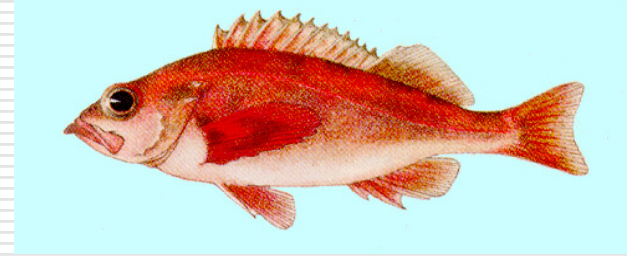
Bocaccio



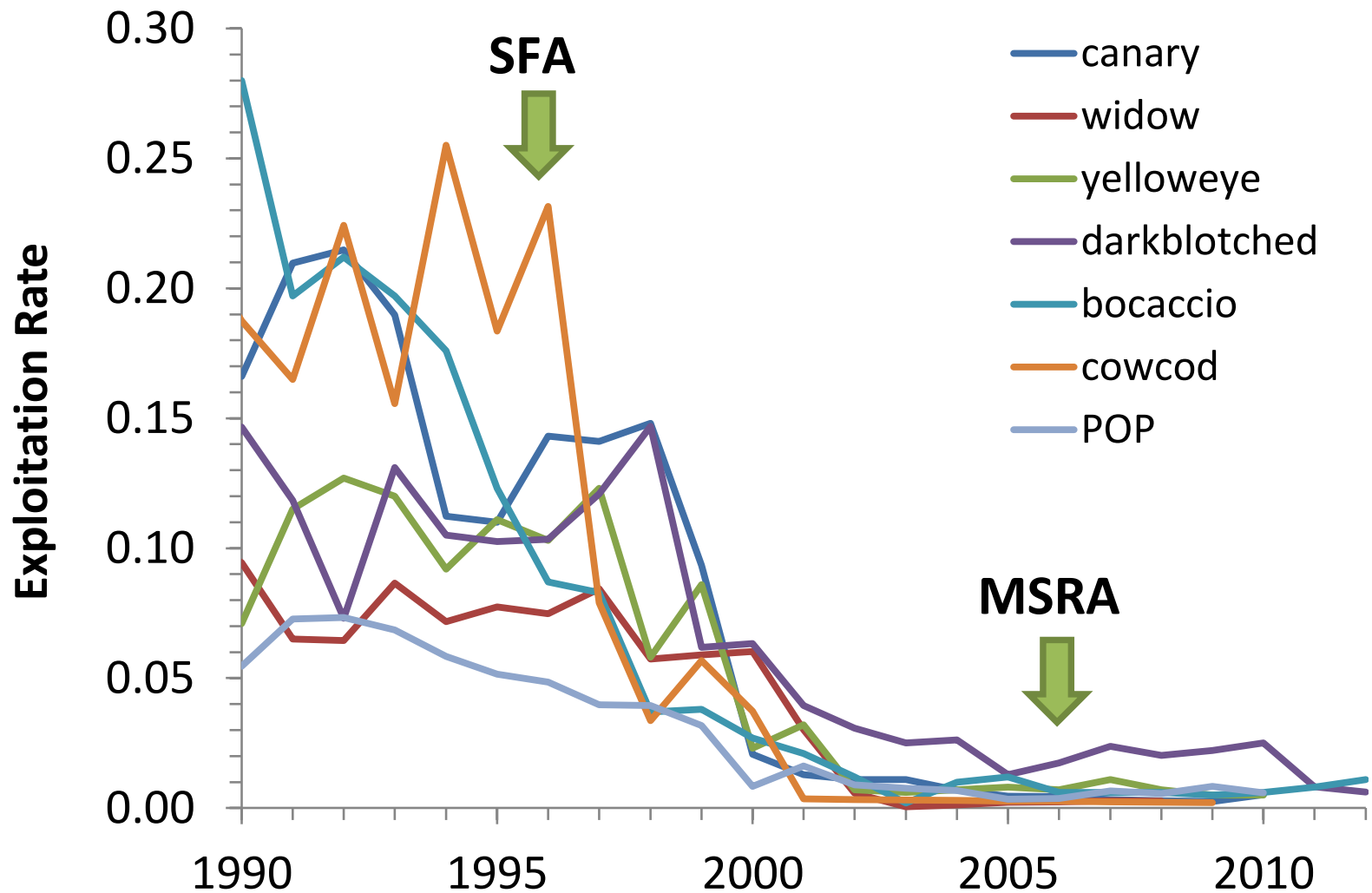
Yelloweye Rockfish



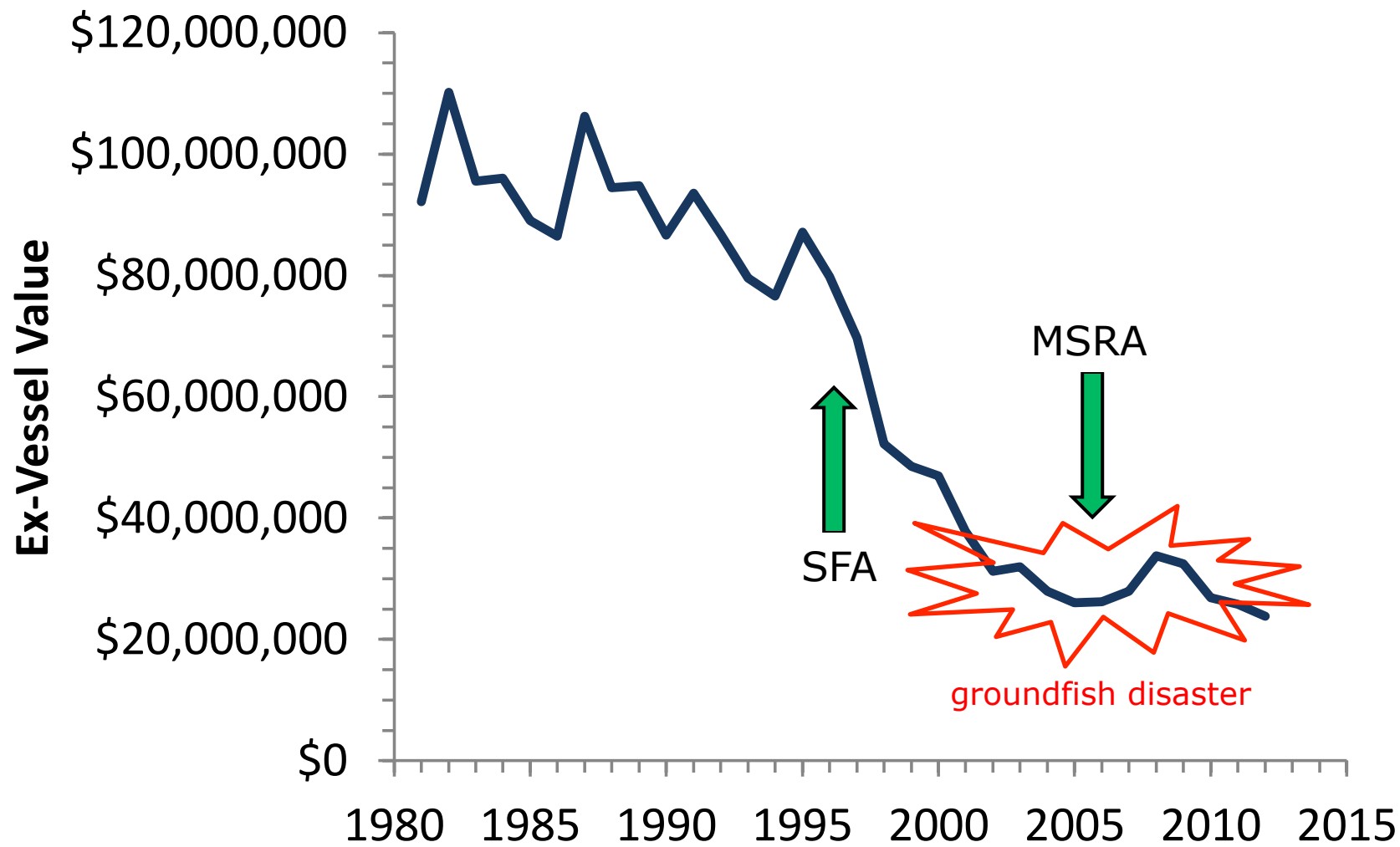
Pacific Ocean Perch (POP)



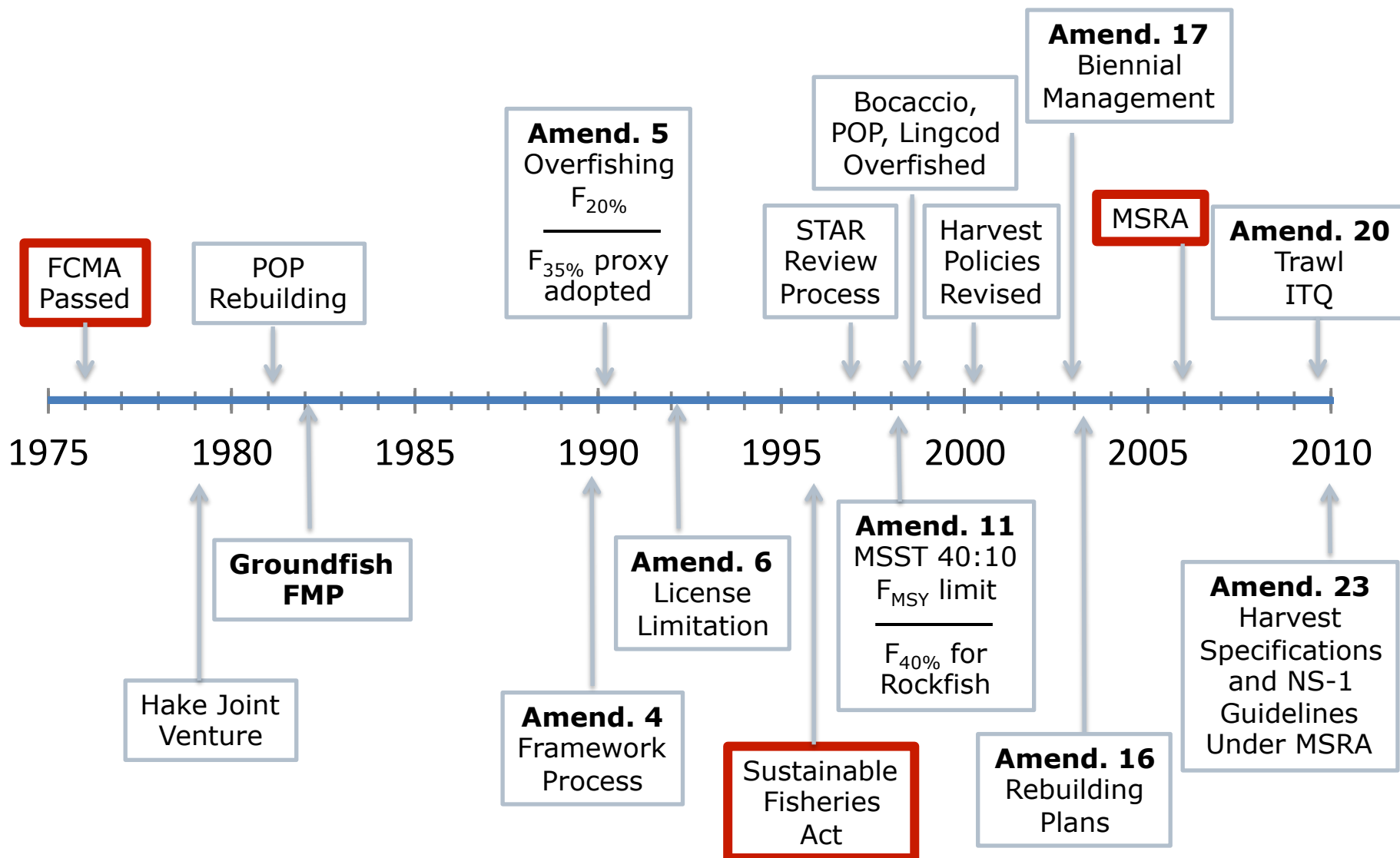
Management Response To Rockfish Depletions Was Dramatic



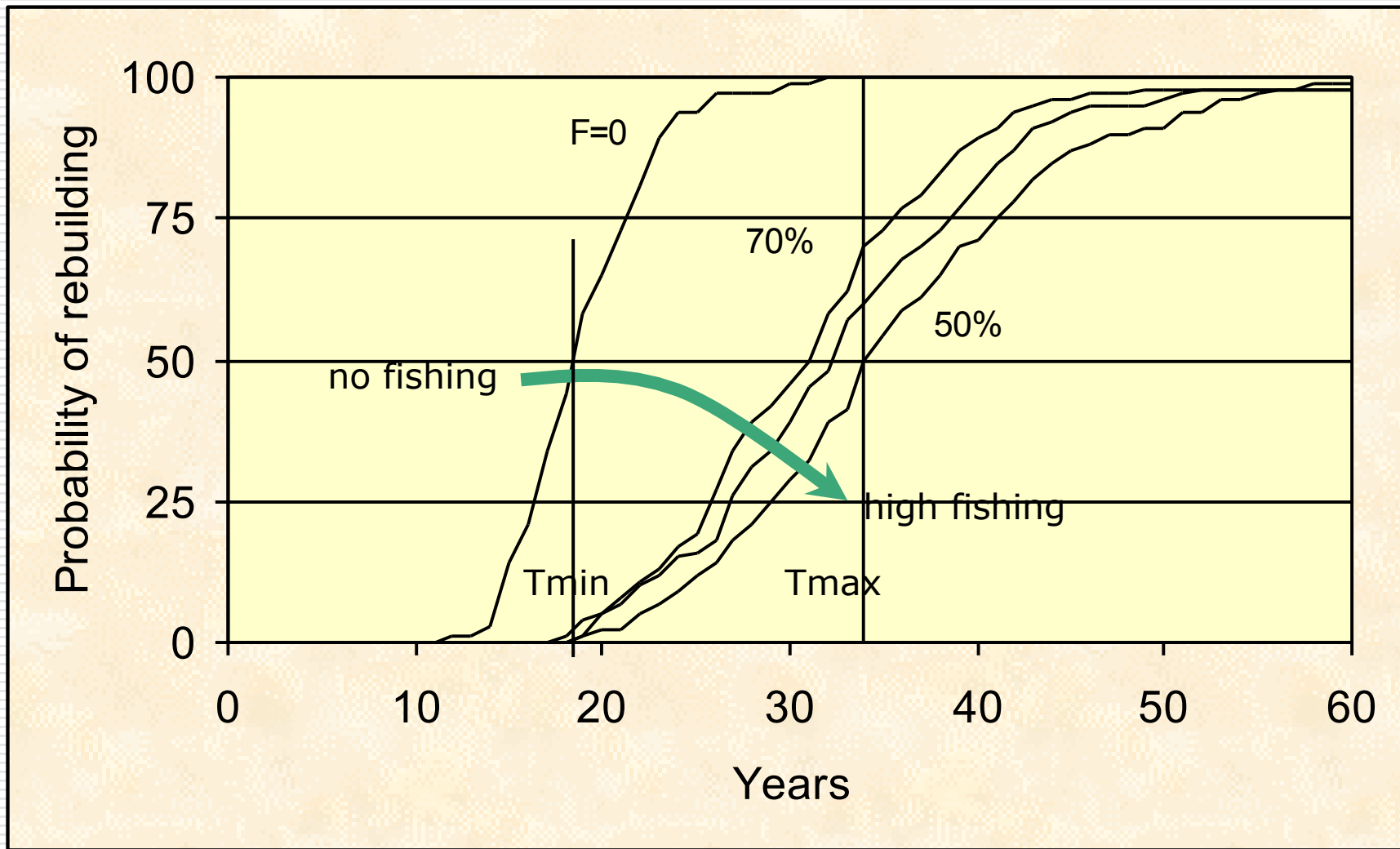
West Coast Groundfish Trawl Revenues (2012 adjusted – tribal & whiting catches excluded)



PFMC Groundfish Management Timeline



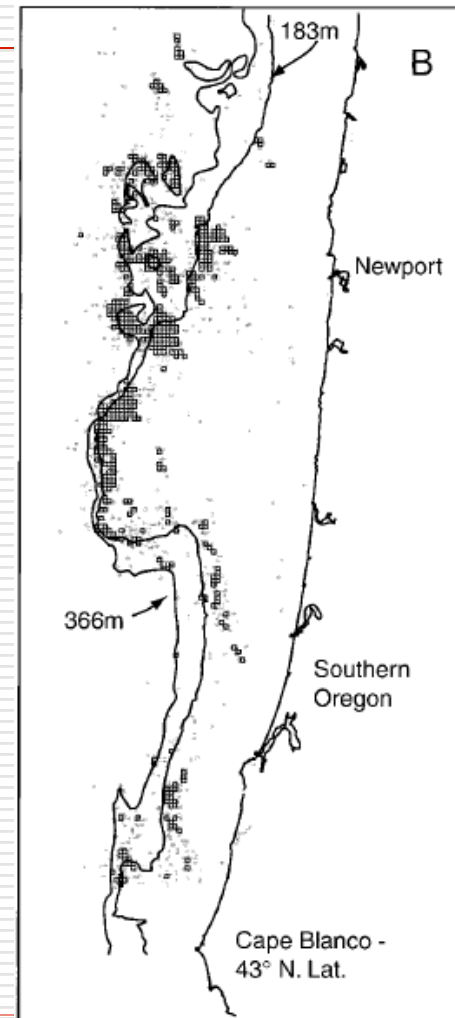
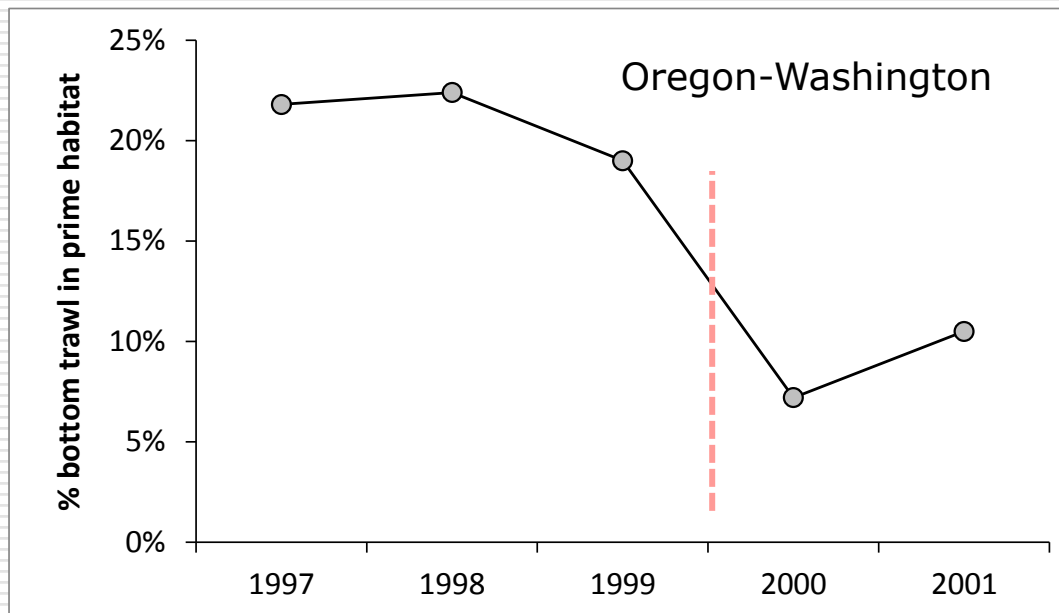
Rebuilding Analysis: as Harvest Rate F the Prob(rebuild) F



Bottom Trawl Roller Gear Reduced to 8" Based on Industry Proposal

Spatial Changes in Trawl Fishing Effort in Response to Footrope Diameter Restrictions in the U.S. West Coast Bottom Trawl Fishery

ROBERT W. HANNAH*



prime rockfish trawlable habitat