CONTROL RULE #1

New England Fishery Management Council

ABC Control Rule
Implementation and Application
in New England

Steve Cadrin
New England
Scientific & Statistical Committee

'ABC Methods' in New England

- The NE SSC developed ABC recommendations to meet the 2010-2011 deadlines for Annual Catch Limits.

- The basis of ABC recommendations and conformance to NS1 guidelines vary among FMPs, and formal ABC control rules have not been developed for all stocks.

- Eventually, all FMPs should include ABC control rules that account scientific uncertainty in OFL and the Council's desired risk tolerance.
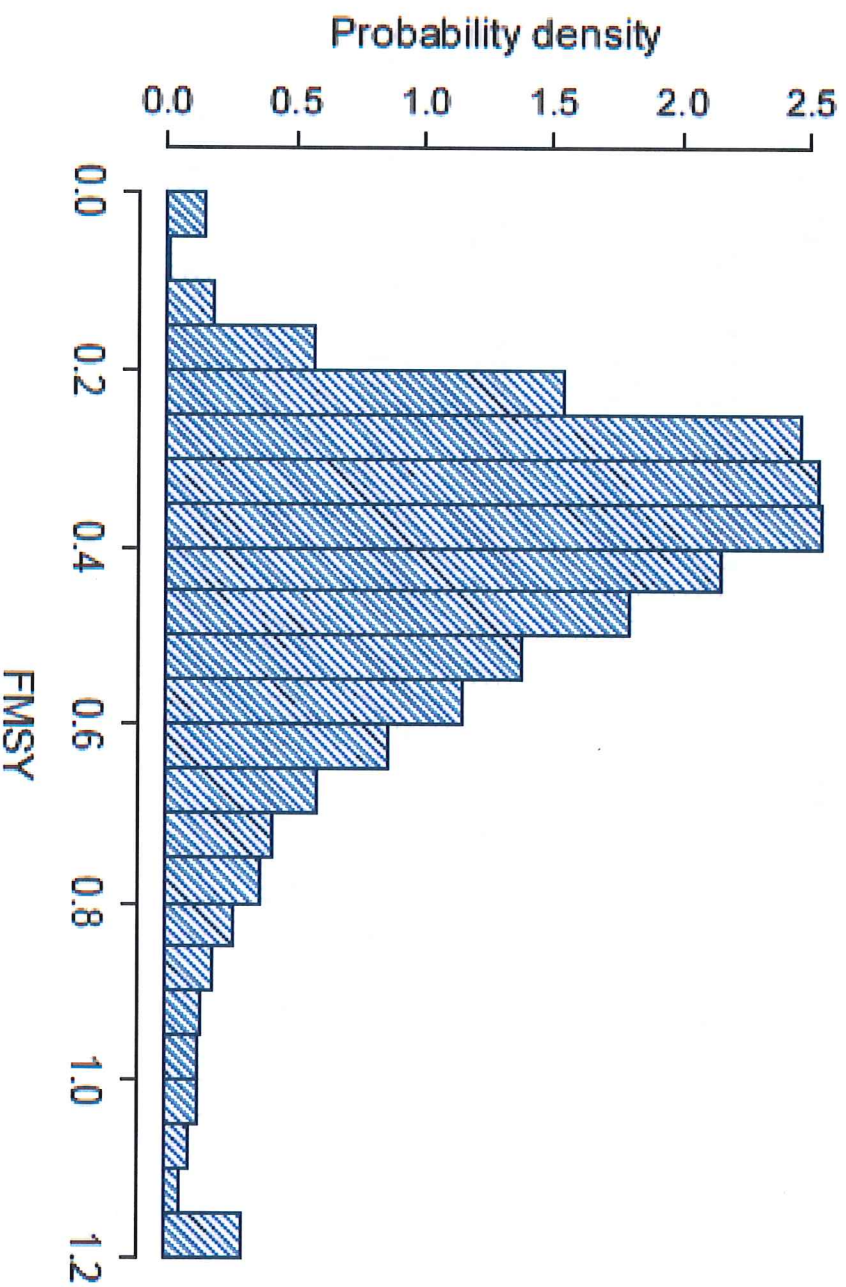
June, November 2010
Terms of Reference

1. Review ABC control rules or methods for deriving ABC in each FMP with respect to their expected performance for avoiding overfishing (i.e., conformance with the Act)

2. Identify the information needed to develop ABC control rules that account for scientific uncertainty in OFL and the Council's desired risk tolerance (i.e., conformance with NS1 guidelines).
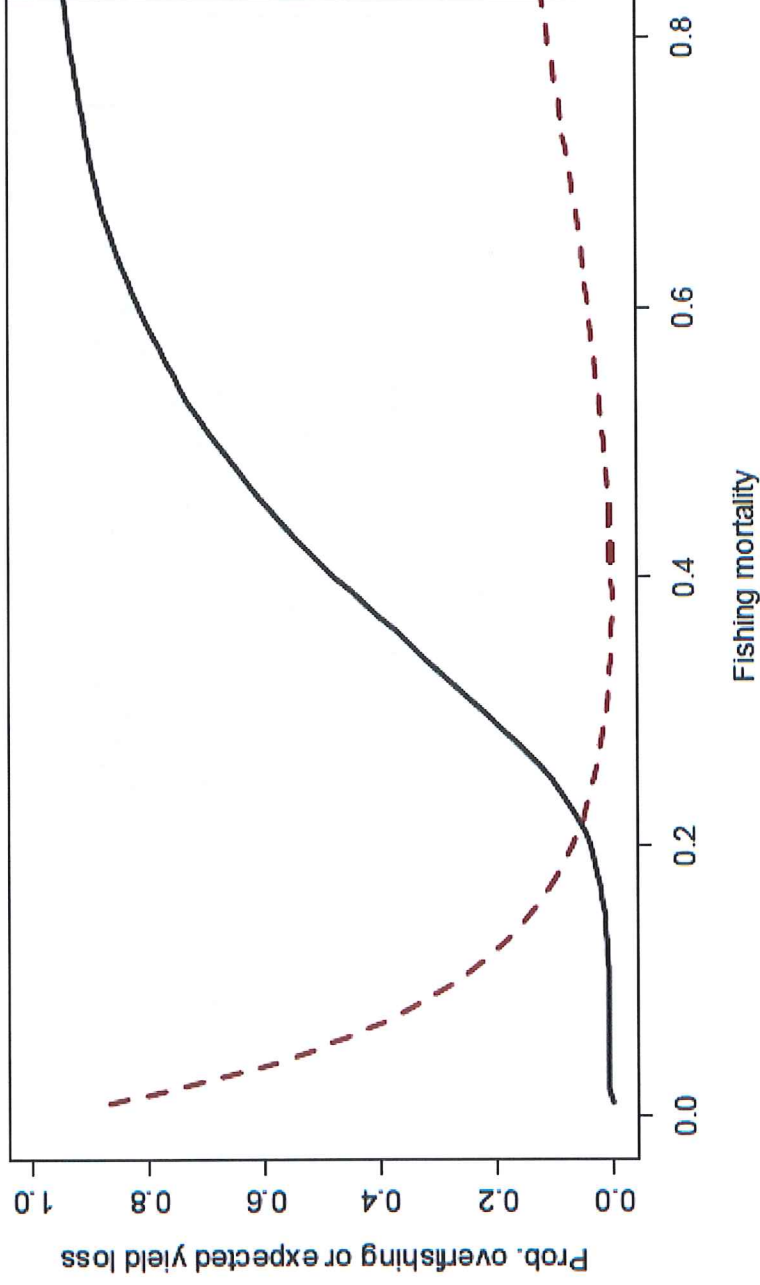
Scallop ABC (Sept 2010)

- Stochastic estimate of F_{MSY} and stochastic projection available.

Scallop *ABC* (Sept 2009)

- Based on the probability of overfishing and the projected loss in yield relative to F_{max}, the SSC endorsed the proposal by the Scallop Plan Team and other conventions of risk-based harvest rules that ABC be based on 25% probability of overfishing.

Scallop ABC (Sept 2009)

- The optimal combination of risk and probability of overfishing is a management option to be determined by the Council, with input from the Scallop Plan Team and the SSC on scientific consequences of alternative degrees of risk.

- For illustration purposes, alternative projections of fishing mortality and yield at alternative probabilities of overfishing were initially provided and P*=25% was accepted.

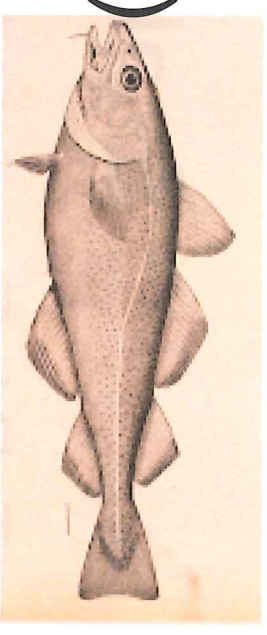| Probability of Overfishing	2010 Fishing Mortality	2010 Yield
20%	0.27	28,473
25%	0.29	29,578
30%	0.30	30,504

Scallop ABC for 2012?

- ToR1: Expected performance for avoiding overfishing.
  - ABC can be based on a nominal probability of overfishing

- ToR 2: Information needed to develop ABC control rules that account scientific uncertainty in OFL and the Council's desired risk tolerance.

  - Need to provide further scientific information on a more strategic decision on risk tolerance:
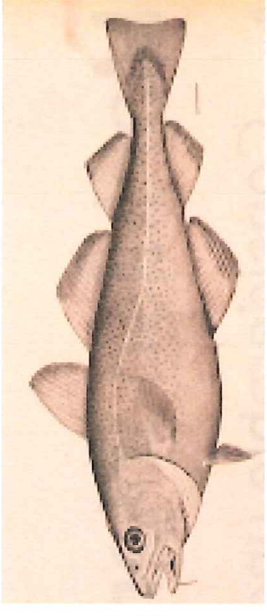
$$R = \sum P^*(c)$$

  - Management strategy evaluation would help to quantify model error

Groundfish ABCs (May 2009)

- Retrospective inconsistencies in most groundfish assessments precluded a probablisitic approach to ABCs.

- In the absence of better information on what an appropriate buffer should be between OFL and the ABC, a relatively simple ABC was applied to all groundfish stocks.

- Given the guidance for specifying ABC as the lesser of $75\%F_{MSY}$ or $F_{rebuild}$, and the definition of optimum yield in the current Multispecies Fishery Management Plan as that associated with $75\%F_{MSY}$, the SSC recommended that the Council consider this ABC specification be applied to all groundfish stocks.
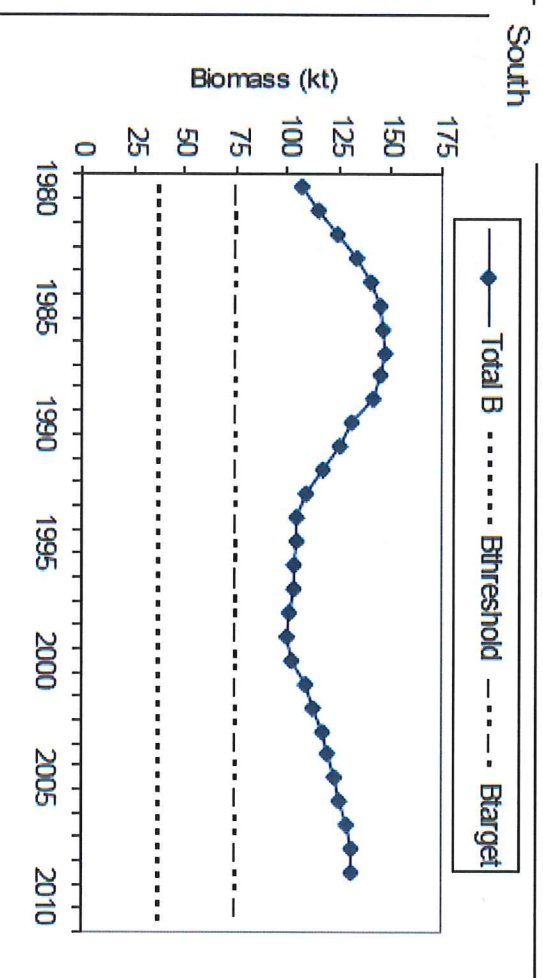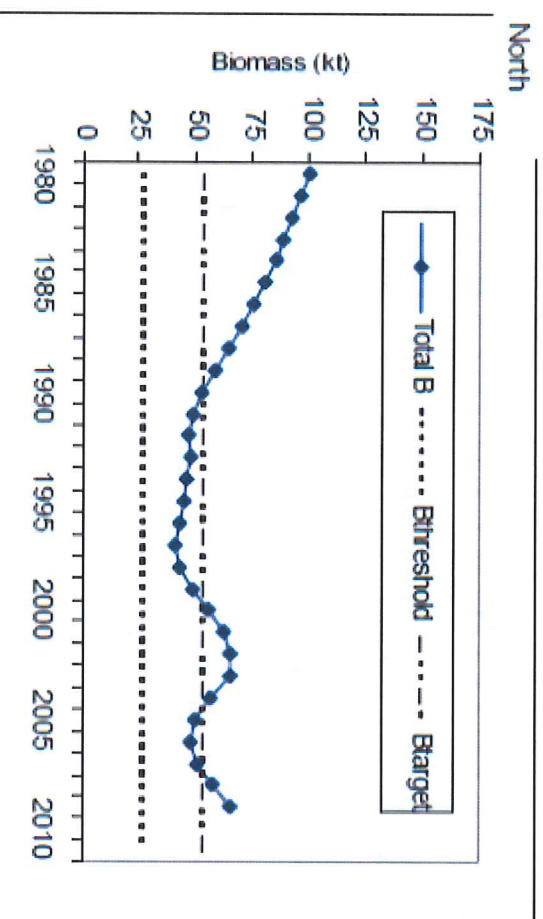
Groundfish ABCs for 2012?

- ToR1 - expected performance for avoiding overfishing.
  - Performance of 75%F_{MSY} has only been generically evaluated for other stocks and situations (e.g., principal groundfish in the late 1990s).
  - Recent 'benchmark' assessment indicated a low probability of exceeding F_{MSY} (e.g., conditional P<10% for pollock)

- ToR 2 - information needed to develop ABC control rules that account for scientific uncertainty in OFL and the Council's desired risk tolerance.
  - Most stocks need reliable stochastic projections (or MSEs)
  - Decision on risk tolerance needed from Council
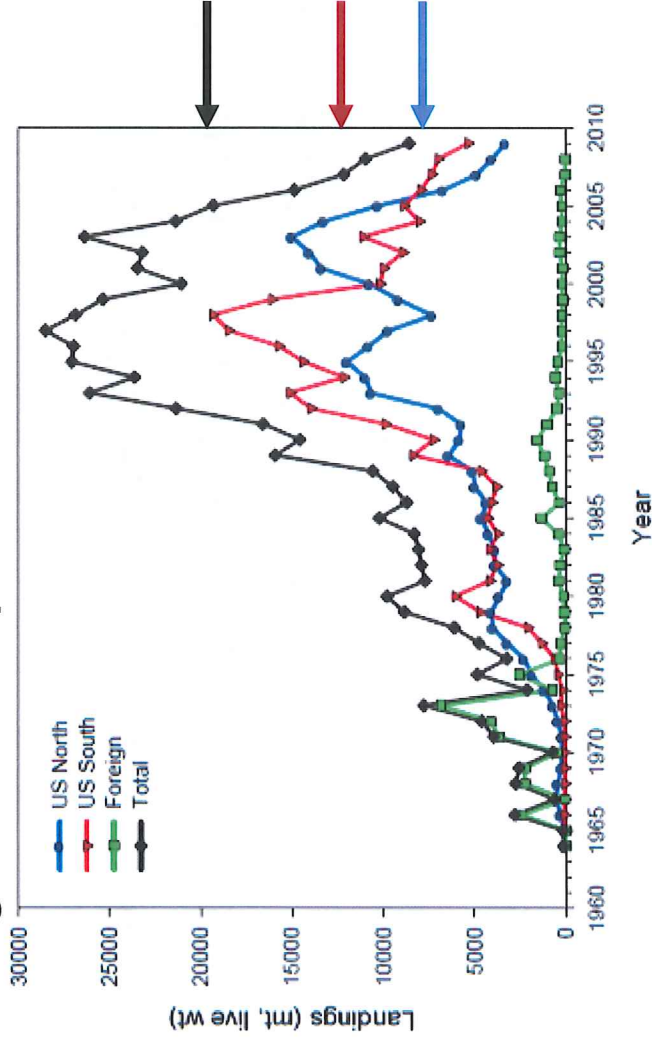
Monkfish Interim ABC (August 2010)

- Considerable uncertainties in the monkfish assessment model preclude its use to determine probability of exceeding the projected OFL.

- The SSC recommended an interim method for determining Acceptable Biological Catch based on average exploitation rate during the recent period of increase in both management units and the most recent estimate or index of exploitable biomass.

North

Biomass (kt)

Legend: Total B, Bthreshold, Btarget

South

Biomass (kt)

Legend: Total B, Bthreshold, Btarget

Monkfish Interim ABCs

- Using average exploitation rates during the most recent periods of biomass increase, ABC is 7,592 mt in the northern area and 12,316 mt in the southern area (40% and 34% of the OFLs).

- Recommended ABCs are approximately twice the 2009 landings, so the SSC recommends that the Council consider Annual Catch Targets that allow incremental increases in catch while monitoring stock response.
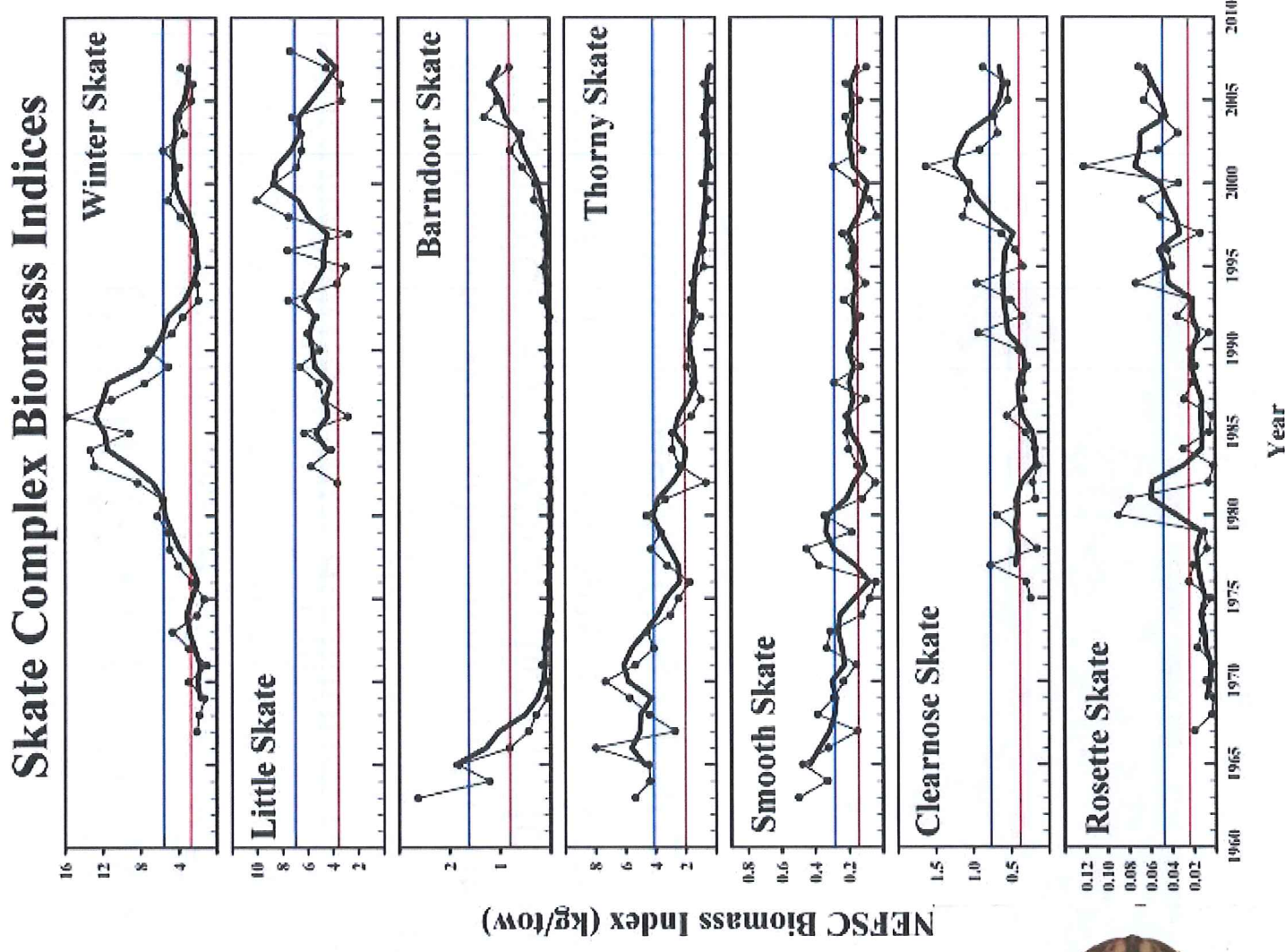
Monkfish ABC 2014?

- ToR1 - expected performance for avoiding overfishing.
  - Recent exploitation rate appeared to be sustainable, but probability of overfishing is not well estimated.
  - Projections of updated assessment indicate low probability of overfishing in the southern area, but high probability of overfishing in the northern area if catch=ABC based on previous assessment.

- ToR 2 - information needed to develop ABC control rules that account for scientific uncertainty in OFL and the Council's desired risk tolerance.
  - Stochastic projections or MSEs needed
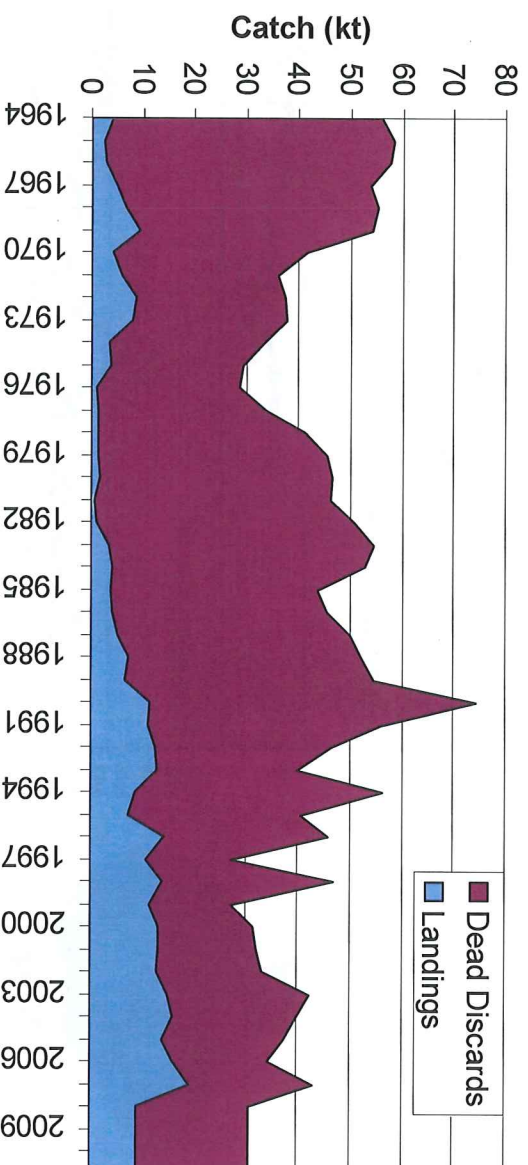 - Decision on risk tolerance needed from Council

Skate Interim ABC (Feb 2009)

- OFL cannot be determined, because overfishing reference points are survey proxies, and estimates of F or F_{MSY} reference points are not available.

Skate Complex Biomass Indices

Skate Interim ABC (March 2010)

- Status of each skate species will continue to be monitored, but the fishery will be managed using a multispecies catch limit, supplemented with additional management actions.

- The interim ABC is derived as the multispecies skate catch associated with the median of the observed series of a catch/biomass exploitation index and the most recent 3-year average of the multispecies skate survey index.

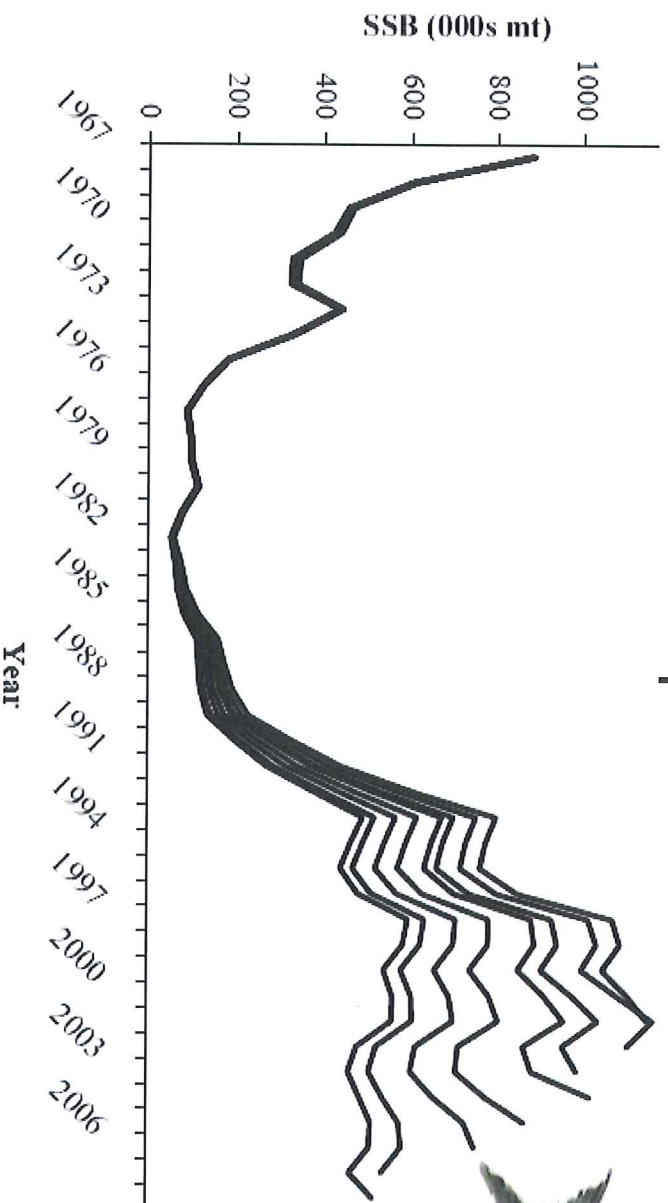- The multispecies ABC is be supplemented with a prohibition on possessing thorny skate.

Skate ABC 2012?

- ToR1 - expected performance for avoiding overfishing.

  – Unknown, but recent exploitation rate appears to be sustainable for most skate species

- ToR 2 - information needed to develop ABC control rules that account for scientific uncertainty in OFL and the Council's desired risk tolerance.

  – Reliable assessment and stochastic projections needed (or MSE of a simple ABC control rule)

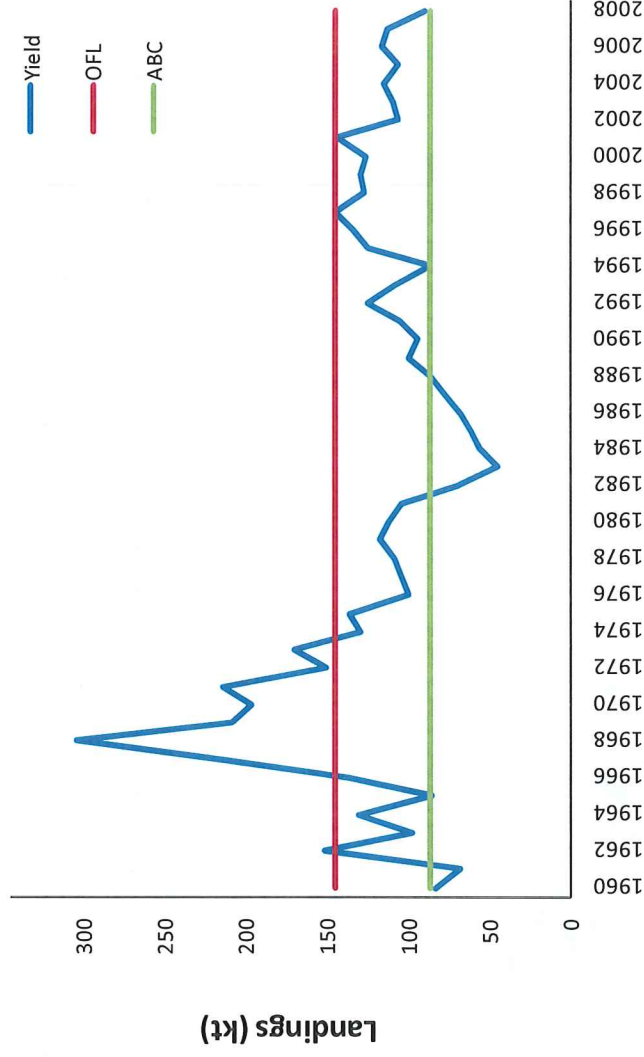 – Decision on risk tolerance needed from Council

Herring ABC (Sept 2009)

- Retrospective inconsistency in biomass estimates is greater than confidence limits.

- ABC recommendation was initially based on magnitude of inconsistency in exploitable biomass (40% buffer between OFL and ABC).

- Council requested that the SSC consider a smaller buffer (17%) based on recent retrospective inconsistency.

SSB (000s mt) vs Year

Herring Interim ABC (Nov 2009)

- The stock complex does not appear to be overfished and overfishing does not appear to be occurring.

- In the context of uncertainties, it would not be appropriate to allow catches to increase.

- Recent catch should be used as an interim ABC.

- The choice of recent time period to use for ABC depends on the Council's tolerance to risk.

Herring ABC 2013?

- Benchmark SAW assessment scheduled for 2012 including management strategy evaluation.
- ToR1 - expected performance for avoiding overfishing.
  - Unknown, but recent catches appear to be sustainable
- ToR 2 - information needed to develop ABC control rules that account for scientific uncertainty in OFL and the Council's desired risk tolerance.
  - Reliable assessment and stochastic projections needed (or MSE of simple ABC control rule)
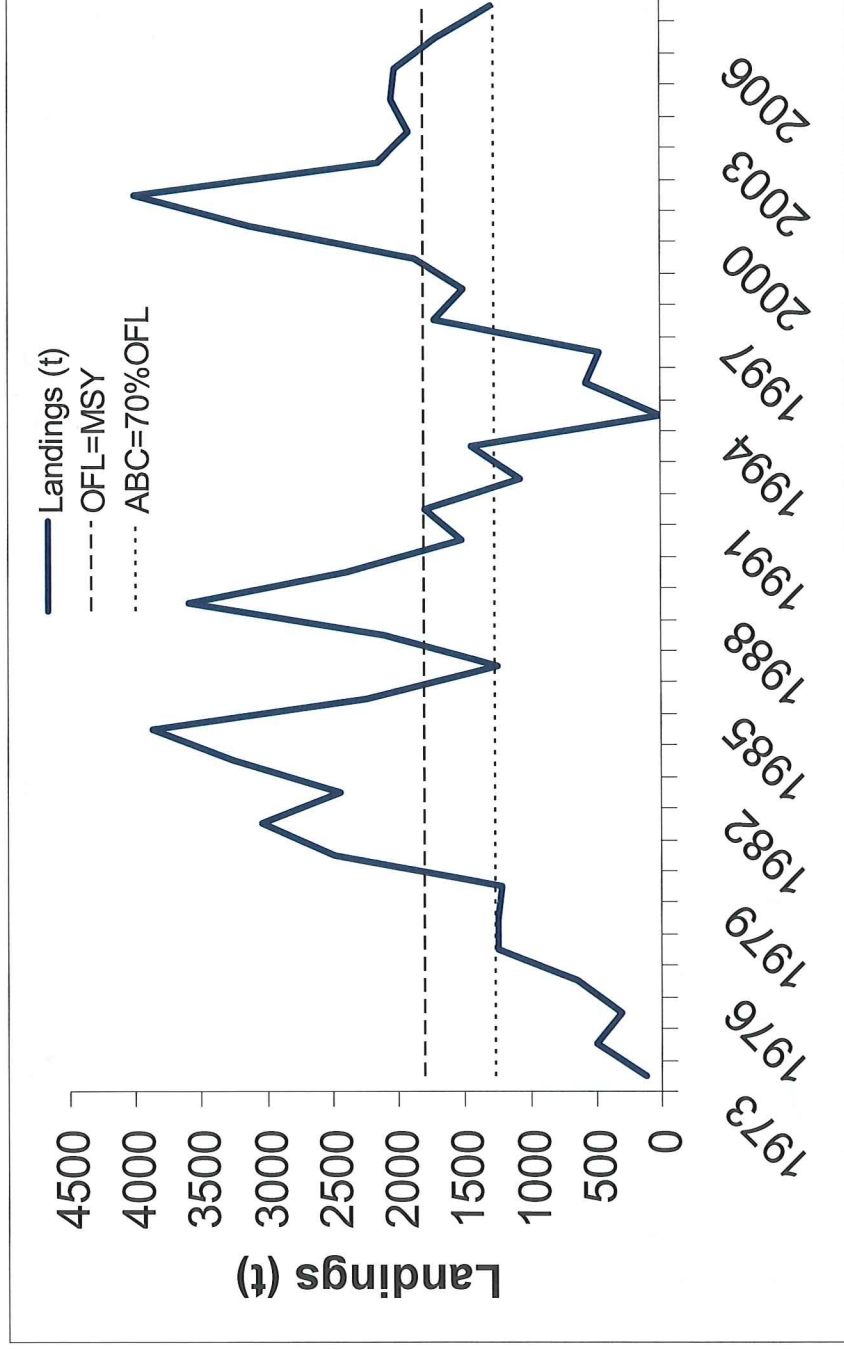 - Decision on risk tolerance needed from Council

Deep-Sea Red Crab (Sep 2009)

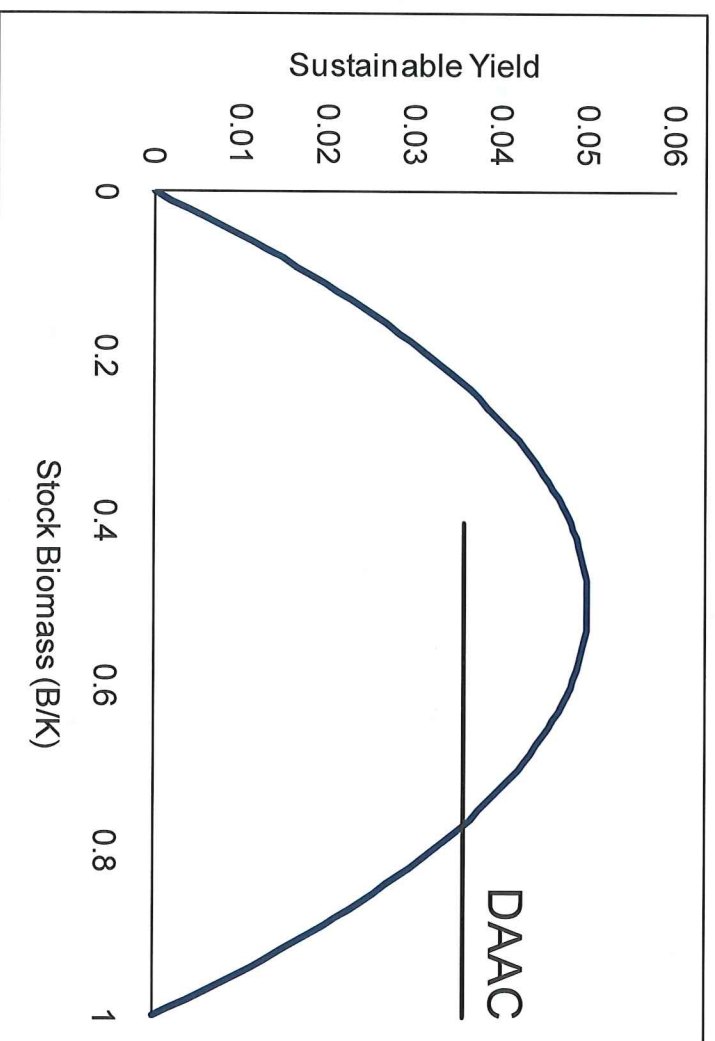- MSY was initially approximated from depletion-adjusted average catch model

$$MSY = \frac{\sum_{t=1}^{t=n} C_t}{\{[n + (B_0 - B_t)]/(0.2 B_0 M)\}}$$

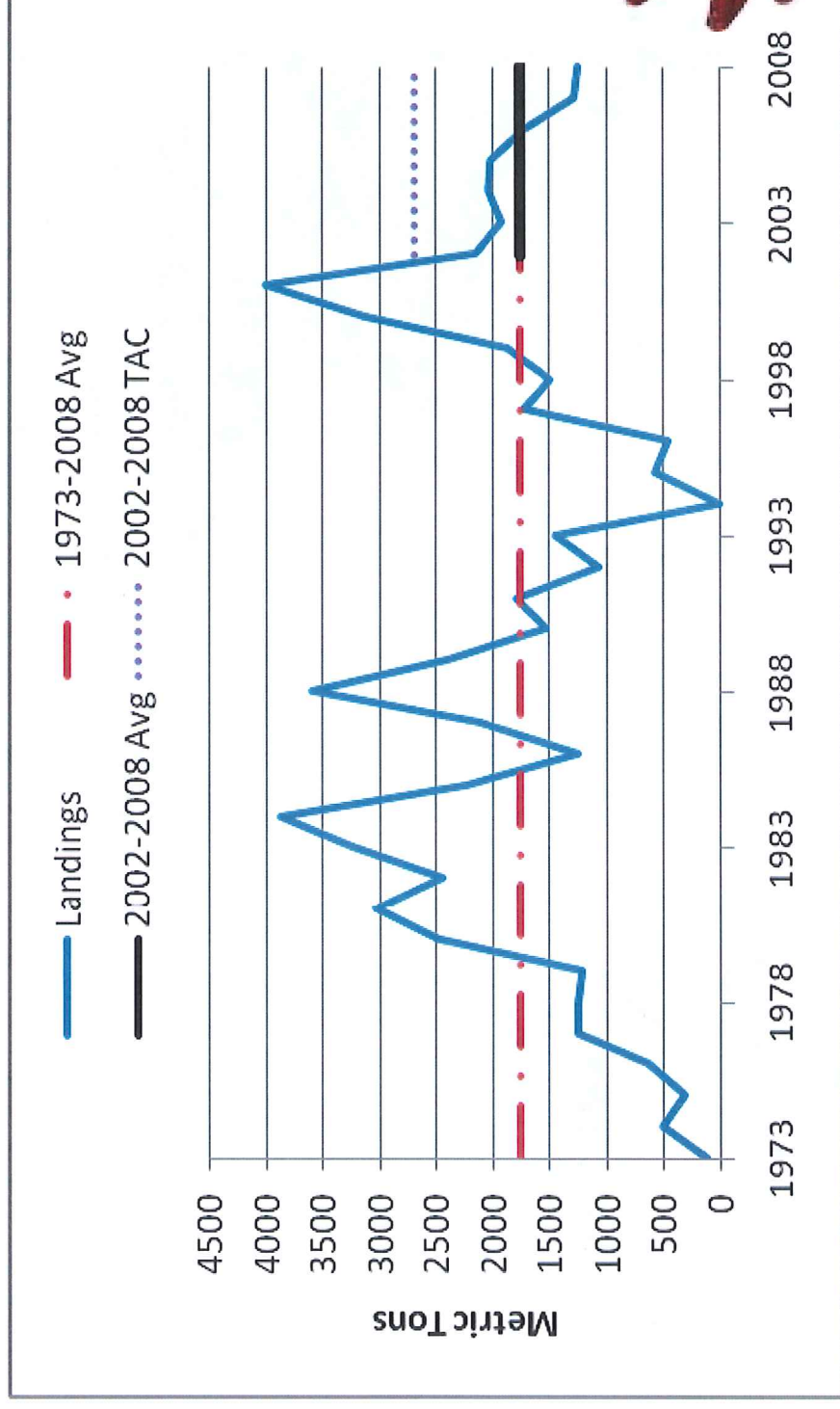- OFL=MSY proxy
- ABC=recent catch=70%OFL

Deep-Sea Red Crab (March 2010)

- The PDT demonstrated that the Depletion-Adjusted Average Catch model developed by the Data Poor Stocks Working Group provides an estimate of sustainable yield that underestimates maximum sustainable yield (MSY).

- Therefore, the information available for red crab is insufficient to estimate MSY or OFL.
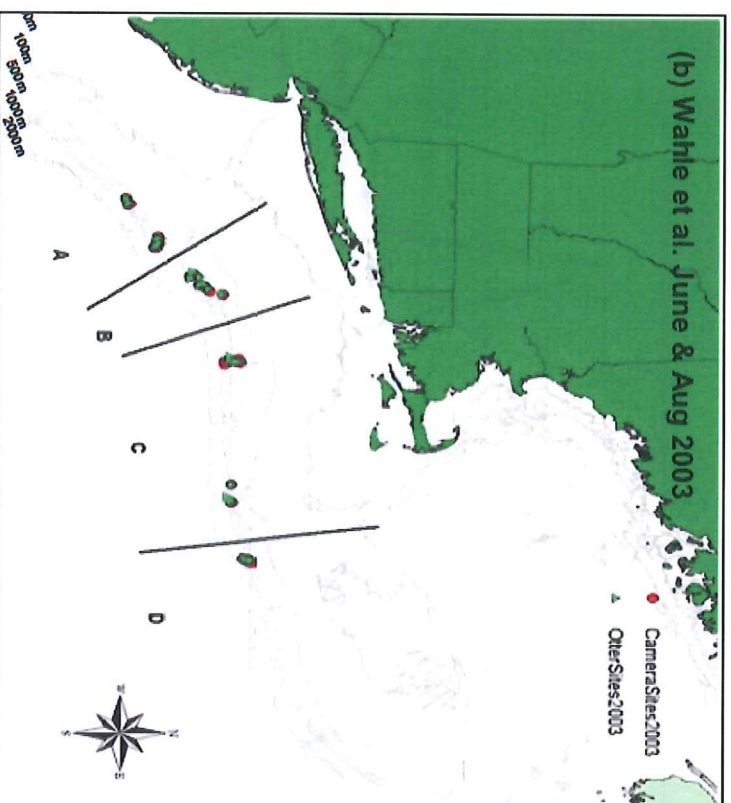
Red Crab Interim ABC (March 2010)

- In lieu of an estimate of OFL, the SSC recommendation for an interim ABC is based on the long-term average landings of males, which is the same result as provided by Depletion Adjusted Average Catch model that assumes no depletion.

Depletion-Adjusted Average Catch

- The two survey estimates of abundance and their variance do not provide evidence of significant depletion from 1974 to 2003-2005.

- The SSC concludes that an interim ABC based on long-term average landings is safely below an overfishing threshold and adequately accounts for scientific uncertainty.

(b) Wahle et al. June & Aug 2003

Deep-Sea Red Crab ABC 2011?

- ToR1 - expected performance for avoiding overfishing.
  - Unknown, but average catch appears to be sustainable
- ToR 2 - information needed to develop ABC control rules that account for scientific uncertainty in OFL and the Council's desired risk tolerance.
  - Reliable assessment and stochastic projections needed (or MSE of simpler ABC control rule)
  - Decision on risk tolerance needed from Council

Strategic Options for ABCs

1. Continue to provide ABC recommendations for each management action.

   – Responsive to Council's needs, fishery and resource conditions

   – May lead to inconsistencies among FMPs and management actions

2. Work with Plan Development Teams and Council to develop ABC control rules that account for scientific uncertainty in OFL and the Council's desired risk tolerance for each FMP separately.

   – More explicit risk and conformance to guidelines

   – Requires scientific and policy development

3. Develop a common approach to ABC control rules for all New England stocks

   – Consistent approach among FMPs and management actions

   – Less tailored to strengths and weaknesses of science and management situations