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Northeast Multispecies Fishery Management Plan

Guidance to the Plan Development Team

For

Developing Acceptable Biological Catch (ABC)

Recommendations

Draft
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I. Background

A. Purpose
The Sustainable Fisheries Act amendments (SFA) to the Magnuson-Stevens Act (MSA) established a requirement that management plans specify acceptable biological catch (ABC) and Annual Catch Limits (ACLs). Recommendations for setting ABC are the responsibility of the Science and Statistical Committee (SSC). The Council then sets ACLs that cannot exceed the ABC specified by the SSC.

The process for setting these specifications for the Northeast Multispecies Fishery Management Plan is specified in Amendment 16. In order to facilitate SSC discussion of ABCs for the twenty managed groundfish stocks, this document outlines the elements of scientific uncertainty that will be considered by the Groundfish Plan Development Team (PDT) when developing ABC recommendations for the SSC's consideration. The PDT will provide the information described in this document to the SSC and will recommend an ABC for each stock. The PDT recommendations are intended to be a starting point for SSC discussion and are not intended to constrain the SSC's choices in any way. This document also summarizes information on management uncertainty that will be provided to the Council to assist in the setting of ACLs.

The publication of this document is intended to improve the transparency of the ABC and ACL setting process for groundfish stocks. It is expected that as experience is gained this document will be revised based on advice from the SSC and guidance from the Council.

B. ABC/ACL Strategy
Amendment 16 establishes the following general guidance for the setting of ABCs and ACLs.

Table 1 – Overview of definitions used in ACL process

Acronym	Definition	Considerations
OFL	Catch at F_{MSY}	Point estimates of F_{MSY}, stock size
ABC	Catch at $F_{control\ rule}$ or $F_{rebuild}$	Scientific uncertainty over current stock size, estimate of F, or other parameters (growth, recruitment, selectivity, etc.)
ACL	<=ABC	Uncertainty from other sources, evaluation of risk to achieving management goals if ABC is exceeded

C. Development of ABC Recommendations
Rosenberg et al (2007) described an approach for setting ACLs in U.S. fisheries that is based on a risk assessment approach. Their approach develops a productivity and susceptibility analysis for each stock based on a categorical analysis of risk factors. The approach described here is based on this paper but modifies it for the setting of ABCs. Each stock assessed with an age-based assessment will be evaluated in terms of stock productivity and assessment uncertainty. The evaluation is scored with a simple

categorical scoring system. Initially individual factor scores will be averaged, but the system allows for weighting the factor scores in the future if it is determined that some factors are more important than others.

For age-based assessment the Northeast Fisheries Science Center (NEFSC) has developed an age-based projection model (AGEPRO). This stochastic projection model provides a distribution of catches that are expected to result from a desired fishing mortality rate. The model can consider uncertainty in the initial numbers at age in the population, recruitment, and natural mortality. Other model inputs (partial recruitment, weights at age, etc.) will be based on recommendations of the most recent assessment review panel. The scores used from the assessment and uncertainty evaluation are used to determine the catch from AGEPRO that the PDT will provide to the SSC as a starting point for discussion of the ABC. In general, when productivity is high and uncertainty is low, the catch recommendation will be near or at the median catch distribution from the model. When productivity is low and uncertainty is high the catch will be selected from the catch that has a higher probability of achieving the fishing mortality rate.

Stocks that are assessed with an index-based assessment are not currently supported with a similar stochastic projection model. For these stocks the evaluation of stock productivity and assessment uncertainty may be more rudimentary since some of the factors may be unknown. In addition, adjusting the projected catch based on these factors may be less formulaic and require additional PDT justification.

There may also be instances when the use of a projection is not recommended. This can occur for a stock whether it is assessed with an age-based projection or an index-based assessment.

II. Scientific Uncertainty

A. Stock Productivity
The following factors will be evaluated by the PDT and reported to the SSC. The SSC and/or Council may consider additional factors when setting ABCs and ACLs. This list may be modified in the future based on SSC advice or Council guidance. For example, ecological factors may be added if they influence stock productivity.

    Stock Biomass: ratio of most recent assessed stock size to target biomass level.

    Recent recruitment: comparison of recent recruitment levels to average and median recruitment levels.

    Weights-at-age: determination whether catch weights at age are declining/low, stable, increasing/high.

    Population age structure: determination whether age-structure is broad or truncated. Evaluation of this factor is complicated by abundance estimates; for

example an exceptionally large year class may make it appear the age structure is concentrated in one year.

Geographic distribution: determination whether stock biomass is broadly distributed according to survey observations or is contracted.

Susceptibility: evaluation of the stock's susceptibility to the fishery: overlap of stock's range with the area fished, ability to be caught by gear used, discard mortality, etc.

Stock Productivity Factors			
Factor	**1**	**2**	**3**
SSB/SSBMSY	Less than 0.5	0.5-1	Greater than 1
Recent recruitment	Below median	Median to average	Above average
Weights at age	Declining/Low	Stable	Increasing/High
Population Age Structure	Narrow/ truncated	Mixed	Dispersed/expanded
Geographic Distribution	Stock becoming concentrated		Dispersed throughout range
Susceptibility			

B. Assessment/Projection Uncertainty
The following factors will be evaluated by the PDT and reported to the SSC. This list may be modified in the future based on SSC advice or Council guidance. The SSC and/or Council may consider additional factors when setting ABCs and ACLs.

Type of assessment: whether the assessment is an index-based assessment, surplus production model, or age-based.

Historic assessment performance: whether the assessment and projections based on the assessment have reliably matched predicted catch to realized fishing mortality rates. This evaluation is independent of a particular assessment model.

Retrospective pattern: whether the assessment has a strong or weak tendency to mis-estimate stock size, fishing mortality, and recruitment.

Catch based on recruitment assumptions: Because assessments are not performed every year, some of the projected catch may be based on an assumption on recruitment that is not yet verified. The larger the percentage of catch based on this assumption the greater the uncertainty that the catch will be realized while fishing at the desired fishing mortality.
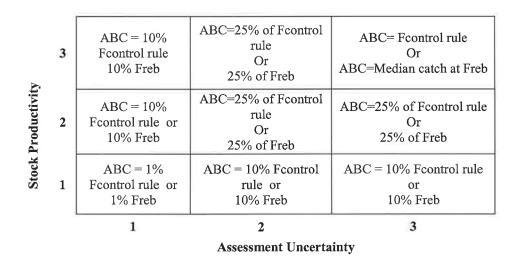
Assessment Uncertainty Factors			
Factor	**1**	**2**	**3**
Type of Assessment	Index/None	SPM	Age-based (VPA, SCAA, etc.)
Historic Assessment Performance	Poor: estimates of F or B highly variable; predicted catch does not match realized F	Fair	Good: Assessment provides consistent estimates over time; predicted catches match realized Fs
Retrospective pattern	Pattern strongly over-estimates terminal year B, or under-estimates terminal year F, persistent	Pattern variable or minor	Minimal or no pattern
Amount of projected catch based on a recruitment assumption	Over 25%	10%-25%	Less than 10%

III. PDT ABC Recommendation

Age-Based Projections

The stock productivity and assessment uncertainty scores will be used by the PDT to determine the PDT's recommendation to the SSC for an ABC. Conceptually, the relevant scores are used to determine which catch distribution from the projection will be recommended for ABC. The SSC will consider the PDT's advice but is not bound by the recommendation and may recommend a higher or lower ABC.

The initial criteria used to determine the catch distribution for ABC is bounded by the requirement that the catch must have a greater than 50 percent probability of achieving the desired fishing mortality rate. As a result, the ABC will not normally be based on catch that is higher than the median catch output by the projection. The following table will be used by the PDT

		1	**2**	**3**
Stock Productivity	**3**	ABC = 10% Fcontrol rule 10% Freb	ABC=25% of Fcontrol rule Or 25% of Freb	ABC= Fcontrol rule Or ABC=Median catch at Freb
	2	ABC = 10% Fcontrol rule or 10% Freb	ABC=25% of Fcontrol rule Or 25% of Freb	ABC=25% of Fcontrol rule Or 25% of Freb
	1	ABC = 1% Fcontrol rule or 1% Freb	ABC = 10% Fcontrol rule or 10% Freb	ABC = 10% Fcontrol rule or 10% Freb

Assessment Uncertainty

Index-Based Projections
Projections for an index-based stock provide a point estimate of catch rather than a distribution. For these stocks the PDT will consider the productivity and uncertainty evaluations and provide a recommended catch, but a decision matrix similar to that shown for age-based projections has not been developed.

Stocks Without Projections
In some instances the projections for a stock may not be available or scientific advice may recommend against using them because of uncertainty. ABC recommendations developed by the PDT for these stocks will include a rationale for the recommendation. The basic approach is to identify a period with stable or increasing stock size and determine the average exploitation during that period. This is then applied to an estimate of current stock size to calculate the catch.