New England Fishery Management Council

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MEMORANDUM

DATE: May 31, 2011

TO: Groundfish Oversight Committee

Science and Statistical Committee

FROM: Augmented Groundfish Plan Development Team (APDT)

SUBJECT: **Groundfish ABCs, 2012 -2014**

1. On May 18, 2011, the APDT held a conference call to continue work on setting groundfish ABCs for fishing years 2012 -2014. The APDT reviewed and discussed regressions of survey indices to estimates of stock biomass in order identify surveys that appear to give a reliable signal of changes in stock size. Members also discussed criteria for evaluating when the surveys indicate that stock biomass may be different than projected biomass. Finally, an example illustrating the planned analyses to determine the accurately of projections was presented. Participating in the call were Tom Nies and Anne Hawkins (NEFMC), Tom Warren, Melissa Vasquez, and Sara Heil (NMFS NERO), Paul Rago, Mike Palmer, Paul Nitschke (NMFS NEFSC), Chris Legault (NMFS NEFSC/SSC), Steve Cadrin (SMAST/SSC), and Kohl Kanwit (Maine DMR).

Survey/Biomass Regressions

2. As discussed in a previous report, the APDT decided to investigate whether survey indices are a reliable indicator of changes in stock size. If they are, then the surveys can be used to verify stock size as projected from the last assessment. The APDT reviewed regressions of survey indices and biomass for GB cod, GOM cod, GB haddock, GOM haddock, CC/GOM yellowtail flounder, SNE/MA yellowtail flounder, plaice, witch flounder, and white hake (see attachments (a) and (b)). Results of the regressions are summarized in Table 1.

Table 1 – Summary of regression of survey biomass to assessment biomass

Stock	Biomass	Spring	Spring Ln	Autumn	Autumn Ln	MA Spring	MA Spring Ln	MA Autumn	MA Autumn Ln
GB Cod	Jan 1	-0.04	-0.07	-0.08	-0.07				
GB Cod	Mean	-0.09	-0.09	0.01	0				
GB Haddock	Jan 1	0.24	0.44	**0.81**	**0.77**				
GB Haddock	Mean	0.19	0.4	**0.81**	**0.77**				
GOM Cod	Jan 1	0.16	0.06	0.02	0.14				
GOM Cod	Mean	0.11	-0.02	-0.04	0.06				
GOM Haddock	Jan 1	**0.61**	**0.72**	**0.58**	**0.75**				
GOM Haddock	Mean	**0.57**	**0.66**	**0.67**	**0.72**				
SNMEA Yellowtail	Jan 1	**0.64**	**0.61**	**0.6**	**0.59**				
SNMEA Yellowtail	Mean	**0.53**	**0.58**	**0.59**	**0.62**				
CCGOM Yellowtail	Jan 1	0.13	0.17	0.03	0.15	-0.03	0	0.01	0.05
CCGOM Yellowtail	Mean	0.09	0.13	0.11	0.18	-0.04	-0.02	0	0.01
American Plaice	Jan 1	**0.75**	**0.62**	0.45	0.18				
American Plaice	Mean	**0.74**	**0.57**	**0.55**	0.35				
Witch	Jan 1	0.24	0.23	0.33	0.29				
Witch	Mean	0.08	0.05	0.34	0.35				
White Hake	Jan 1	0.34	0.34	0.34	0.32				
White Hake (2)	Jan 1	0.35	0.36	0.36	0.34				

Green boldfaced font means r^2 >= 0.5
Yellow highlight means regression significant (p<= 0.05)
Note: Acadian redfish will be analyzed in a subsequent report

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3. Members discussed criteria for determining whether a survey may be giving a reliable signal of changes in stock size. The initial criteria that were agreed to were:

a) The regression coefficient is statistically significant at α=0.05;
b) The relationship between survey and stock size is positive

4. Members discussed whether a minimum correlation coefficient should be a third criteria used to evaluate the regressions. As an alternative, criteria that will be examined will be to jackknife the regression analysis for each survey/stock combination, predict the dependent variable for each missing year, and evaluate the frequency that the prediction interval includes the actual data. This should facilitate development of more objective criteria for evaluating whether a regression that meets the first two criteria is a reliable indicator of stock size. It is possible that a significant regression nay not be a reliable indicator of stock size.

5. As shown in Table 1, none of the regressions for either cod stock were significant. Additional steps for these stocks will include:

a) GOM cod will be assessed in December, 2011 (SAW 53), so it seems of little value to pursue the survey approach with a pending assessment. Staff will explore alternative processes that would allow the Council to delay setting the GOM cod ABC until after the assessment is completed.
b) The DFO GB cod survey index will be obtained to see if that regression performs any better.
c) Age-based indices for GB cod will be examined to see if they provide information that may be useful. Unlike other stocks, these indices will be available for the years 2008-2010 because they are used in the TRAC.
d) Eastern GB cod will be assessed at the TRAC in June. While at times there have been diverging trends between the TRAC assessment and the assessment for the entire stock, in the absence of other data this assessment may be an indicator of GB cod stock size.

6. If the APDT concludes that a survey is a reliable indicator of changes in stock size, the next step is determining when the survey stock size is sufficiently different from the projected stock size that the survey estimate is preferred to the projection. The APDT believes that this evaluation should not be based on a single year due to the variability of the surveys.

a) An idea considered by the APDT is that the survey is only considered sufficiently different from the projection results if the appropriate confidence intervals do not overlap. The APDT discussed whether this would lead to less likelihood that adjustments

would be made when either the survey regression or the projection is highly uncertain: with wider confidence intervals it is less likely that they will not overlap. The counter interpretation is that the surveys that are the best predictor (that is, have the smallest confidence intervals) are the ones most likely to lead to a change in catch advice.

b) It may be possible to quantify the degree of overlap between the derived survey biomass (S) and projected biomass (P) intervals. The probability of observing S within the confidence interval of P might be computed.

7. Assuming the analyses suggest that the projected biomass is incorrect, the survey estimate could be larger or smaller. An adjustment to catch advice could be made in either case, or only if survey biomass is lower than projected biomass. The APDT asks the SSC for guidance on whether they anticipate increasing catches if the survey suggests stock size is larger than the projected stock size.

8. Some options were identified for adjusting catch advice when the survey biomass differs from the projected biomass:

a) Adjust catch advice from the projection down (or up) by a percentage based on the difference between the survey and projected biomass.

b) If the projection is deemed unreliable, ad hoc approaches might include status quo ABC or catch.

Review of Projection Performance

9. The APDT reviewed an example of the work planned to determine if projections are reliable (see attachment c). Briefly, the example used the 2010 Georges Bank yellowtail flounder assessment as the starting point. A retrospective analysis was conducted to peel back data to 2000 and this assessment was used as the starting point for projections. Five year average weights, selectivity, and maturity along with the recruitment estimated from this assessment were input to AgePro and projections conducted through 2010. The projections set the catches in years 2001 through 2010 equal to the values used in the 2010 assessment. The 80% confidence intervals for the projected SSB from the AgePro results were compared to the SSB point estimates from the 2010 assessment under three different starting conditions: 1) the estimated numbers from the short time series assessment, 2) an adjustment to these starting numbers that represented a well-implemented retrospective adjustment, and 3) the actual numbers at age in 2001 from the 2010 assessment without any uncertainty. The first case SSB projections were all well above the 2010 assessment estimates of SSB due to the starting point being well above the 2010 assessment value in 2001. Both the second and third case performed reasonably well, meaning the confidence intervals overlapped the 2010 assessment SSB values and the medians were similar to the estimated values for 3-4 years, but then the projections diverged to much higher SSB values because the recruitment used in the projections was too high relative to that estimated in the 2010 assessment. In both the second and third case, some of the projection realizations "crashed" because the catch was too high relative to the projected population

abundance even though the medians increased dramatically. Once this system is automated and a large number of stocks and projection starting years are analyzed, it is hoped that some rules of thumb can be developed regarding the number of years which can be projected with reasonable skill and which factors are driving any mismatch issues.

Attachments:

(a) Survey-biomass regressions

(b) Data appendix for survey-biomass regressions

(c) Powerpoint presentation titled "Example Projection Results (preliminary)"