



New England Fishery Management Council

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**To:** Tom Nies, Executive Director  
**From:** Scientific and Statistical Committee  
**Date:** September 3, 2013

**Subject: Spillover of haddock between the Georges Bank and Gulf of Maine stocks**

The SSC met on May 16, 2013 to address the following terms of reference (TORs):

- 1) Review the work of the Groundfish PDT on the haddock spillover issue.
- 2) The SSC should address whether they agree or disagree with the PDT consensus statement on the issue. If the SSC disagrees, the SSC should
  - a. Provide an estimate of the amount of spillover when large year classes of GB haddock occur.
  - b. Provide suggestions as to how the anticipated spill-over of the strong 2010 year class can be used to adjust the GOM haddock ABC for FY 2013, 2014, and 2015

The SSC considered the following documents in its deliberations:

1. Memo from PDT to SSC re GB haddock spill-over (August 2013)

As the strong 2010 year class of Georges Bank haddock becomes fully recruited to the fishery, the Council expressed concern that, given the large disparity in stock size and consequent ACLs between the Georges Bank and Gulf of Maine stocks, any spillover of fish from the former to the latter could result in the Gulf of Maine ACL being quickly reached. Therefore, the Council passed the following motion to further explore the issue:

*To task the PDT and SSC to examine the issue of GB haddock spillover into the GOM stock area, provide an estimate of the amount of spillover when large year classes of GB haddock occur, and provide suggestions as to how the anticipated spill-over of the strong 2010 year class can be used to adjust the GOM haddock ABC for FY 2013, 2014 and 2015.*

The TORs developed in response to this motion ask the SSC to (1) review the work of the PDT on the issue, and (2) determine whether or not the SSC agrees with the PDT consensus. Additional TORs are relevant only if the SSC disagrees with the PDT consensus.

The SSC commends the work done by the PDT to examine this issue from a variety of approaches, including literature review, diagnosis of assessment results, and projection of stock trends and consequences under alternative decisions about how much to adjust the Gulf of Maine haddock ABC. As a result of its efforts, the PDT developed a series of consensus statements on the issue (section 1.7 of the PDT memo to the SSC). Those are summarized below, with SSC responses:

Definition of “spillover” is unclear

The SSC agreed that “spillover” can imply different mechanisms that have different implications for both stock assessment and management. One possibility is that spillover refers to normal movement back and

forth across a permeable stock boundary (e.g., exchange rates). Stock assessment models assume that this does not take place, or at least that the extent of movement is sufficiently negligible that the model can safely ignore it. If this assumption is not valid, the appropriate response is to expand the stock boundary, use a model that links the two stocks or otherwise modify the analytical framework.

Another possibility is that spillover refers to the expansion of an otherwise independent stock across its boundary into another at a time of especially high density. This is presumably the process motivating this question given that the rationale implies unidirectional movement from Georges Bank into the Gulf of Maine, and only in response to a large cohort. The PDT and SSC both reviewed maps of survey data that did not show clear evidence of the Georges Bank stock expanding beyond its borders. This process is further discussed under “Assessment diagnostics” below.

#### Estimation of exchange rates

The PDT reviewed empirical studies of exchange rates, and concluded that exchange rates are not well characterized. The SSC agreed with this conclusion. The SSC further noted that the literature perhaps suggests an upper bound of 10%, but that this figure is not robust. Also, any exchange that does take place is likely restricted to certain boundary areas, rather than a process operating on a stock-wide level.

#### Risk analysis

The PDT concluded that, if spillover assumed but is not occurring, the consequences for the Gulf of Maine stock could be severe. This is because the magnitude of the difference in stock sizes and ACLs means that even a small assumed exchange rate could result in catch many times the current Gulf of Maine ACL, and could even approach the entire estimated biomass in the Gulf of Maine. This significant risk, coupled with the lack of compelling empirical evidence, was the SSC’s primary reasons for agreeing with the PDT conclusion that adjustments are not advisable.

#### Assessment diagnostics

The PDT noted that, if expansion of the Georges Bank stock across its border in response to strong cohorts does occur, then fish from the large 2003 year class on George Bank should have also appeared as a strong cohort in the Gulf of Maine assessment, obscuring cohort tracking in the assessment. This was not the case. Moreover, even a small amount of spillover of such a large cohort would have caused a sudden and drastic increase in the Gulf of Maine biomass. This was also not the case. The SSC supported the PDT interpretation of these diagnostics.

Based on the considerations summarized above, the PDT concluded that there is not a scientific basis for adjusting the haddock ACLs. The SSC agreed with this conclusion. Therefore, responses to TORs 2a and 2b are not relevant.

The SSC noted that if fishermen are observing abundance of haddock in the Gulf of Maine that does not seem to comport with the outcomes of the assessment, this might be due to a recent increase since the terminal year of the last assessment update (2010). If so, the appropriate response is to update the Gulf of Maine haddock assessment to see if that change is detected.

The SSC also noted that addressing a risk of this sort is best done using a systematic risk evaluation framework, whereby the consequences of making different assumptions is evaluating based on different possible realities. That evaluation should be done in both directions, i.e., considering the implications of assuming different levels of spillover when it is not happening and assuming that spillover is not happening when it is, in terms of both the economic losses and biological risks.