New England Fishery Management Council
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To: Tom Nies, Executive Director
From: Scientific and Statistical Committee
Date: September 15, 2014

Subject: Whiting (silver hake) and red hake overfishing levels (OFLs) and acceptable biological catch (ABC) recommendations for fishing years 2015 – 2017

The SSC met on August 26, 2014 in Boston, Massachusetts, to address the following term of reference (TOR):

Review the recent assessment updates and the work of the Whiting Plan Development Team (PDT) and provide an OFL and an ABC for each year for northern silver hake, southern silver hake, northern red hake and southern red hake for fishing years 2015-2017 that will meet management objectives and prevent overfishing.

To meet this TOR, the SSC considered the following documents:

3.1 2013 Small-Mesh Multispecies SAFE Report (Draft August 2014)
3.2 Presentations by Whiting Plan Development Team members Andrew Applegate and Dr. Larry Alade
3.3 Acceptable Biological Catch Recommendations for Whiting for Fishing Years 2012 – 2014 (Sep 13, 2011 Memo from SSC to Tom Nies)

The SSC recommends OFLs for each of the four hake stocks as estimated during the operational assessment and ABCs using the current control rule, estimated by the NEFSC and reviewed by the Whiting PDT. These specifications would remain the same in 2015, 2016 and 2017 in the absence of new information suggesting a change is warranted. The values are as follows (all in metric tons, mt):

Stock	Fishing year 2015-2017	
	OFL	Annual ABC
Northern silver hake	43,608	24,383
Southern silver hake	60,148	31,180
Northern red hake	331	287
Southern red hake	3,400	3,179

In developing this catch advice, the SSC considered the reasons for overfishing of the northern stock of red hake. The fishing year catch exceeded the ABC (by 38% in 2012 and by 29% 2013)[1] and the OFL (by 23% in 2012 and 15% in 2013), and the relative F in 2013 exceeded the F_{MSY} proxy (by 6%), but the three-year (2012-2014) stock biomass index did not decline, influenced mostly by the higher 2014 biomass estimate and new recruitment first observed in spring 2014. Therefore, overfishing was primarily a result of exceeding catch limits rather than scientific uncertainty that led to substantial misspecification of catch advice. The most appropriate response is to more effectively control catch, including improved estimation of discards, rather than revise the risk tolerance (i.e., percentile of OFL for ABC). Concerns about the overfishing definition lead the SSC to recommend that the biological reference points should be updated at the next appropriate opportunity and more thoroughly re-evaluated at a benchmark assessment.

In particular, movements of fish in response to variations in environmental conditions have the potential to alter both survey indices and landings. Several published studies have identified associations between red and silver hake distributions and temperature, with the relationships being particularly strong for silver hake. Given that the reference points for these stocks rely on survey indices, temperature-dependent movements or changes in catchability have the potential to alter the perception of the stock. For example, the Gulf of Maine has warmed rapidly since 2004, and this increase in temperature mirrors the increase in northern silver hake. If the increase in the survey index is driven by increased catchability rather than an increase in abundance, there is an increased risk of overfishing (and, conversely, foregone yield during cold periods). Fish responses to climate change may also alter distributions and induce changes in productivity, which may influence our perception of assessment stock boundaries. Future assessments for these stocks should evaluate whether temperature or other environmental indicators (e.g. the Gulf Stream North Wall Index) can explain variability in the survey indices as well as changes in stock structure, and if so, should consider how to incorporate this knowledge when setting benchmarks.

The SSC noted that selection of the 25th percentile for setting the silver hake ABC was chosen by the Council for other considerations besides climate change, is more risk-averse than the 40th percentile used for red hake and might serve as an additional buffer against uncertainty due to climate change, but should be more explicitly evaluated.

Finally, the SSC appreciated the PDT's preparation of an integrated SAFE report, combining the assessment results, OFL and ABC calculations, socio-economic information in the form of a Fishery Performance Report chapter, and other useful information. The inclusion of the Fishery Performance Report was especially welcome as it addresses a recommendation made by the SSC in order to better utilize our social science expertise. Currently, the social scientists on the SSC are meeting as a sub-group to identify priority metrics and recommendations for incorporating those metrics into development of catch advice. The PDT's SAFE report will serve as a useful model of the continuing work of the social science sub-group.

[1] New information reviewed by the Whiting PDT after the SSC meeting indicates that the 2012-2014 OFL was underestimated by 53 mt and the 2012-2014 ABC was underestimated by 39 mt. Taking these corrections into account, the fishing year catch exceeded the ABC (by 21% in 2012 and by 13% 2013) and the OFL (by 5% in 2012) The fishing year catch was under the corrected OFL by 2% in 2013.

Summary of recommendations

1. **OFLs and ABCs should remain unchanged for each stock in 2015, 2016 and 2017 in the absence of new information suggesting otherwise. Values for each are provided in the table above.**
2. **Overfishing of the northern stock of red hake was due to exceeding catch limits, rather than misspecification of catch advice due to scientific uncertainty. Therefore, efforts are needed to better control catch, including improved estimation of discards.**
3. **Reference points should be updated at the next appropriate opportunity and more thoroughly re-evaluated at a benchmark assessment.**
4. **Effects of changing temperatures on the behavior of both red and silver hake, and therefore their availability to the survey and fishery, should be thoroughly investigated given the implications for assessment outcomes, catch advice and catch.**
5. **Inclusion of a Fishery Performance Report in the integrated SAFE report was a welcome addition. The SSC's social science sub-group is developing recommendations for how to utilize information included in the development of catch advice.**