



New England Fishery Management Council

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DRAFT MEMORANDUM

DATE: September 8, 2014
TO: Scientific and Statistical Committee (SSC)
FROM: Groundfish Plan Development Team (PDT)
CC: Groundfish Oversight Committee (OSC)
SUBJECT: **Gulf of Maine (GOM) cod ABCs**

The Groundfish Plan Development Team (PDT) discussed and/or completed analyses for **Gulf of Maine (GOM) cod ABCs/OFLs for FY 2015- FY 2017**.

2014 Update Assessment

Overview

GOM cod was assessed in August 2014, at the peer review of the update assessment, using a statistical catch-at-age model (ASAP). The assessment was an update of the 2012 SARC 55 benchmark assessment, including commercial and recreational fishery catch data, research survey indices of abundance, and the analytical assessment models through 2013.

There are two population assessment models from the 2012 benchmark assessment, the $M=0.2$ (natural mortality, $M=0.2$) and the M-ramp (M ramps from 0.2 to 0.4) were examined. The overfishing reference point ($F_{40\%}$ assuming $M=0.2$) was estimated with minor changes to the data inputs (maturity, weights, selectivity), but the value of $F_{40\%}$ was the same as that estimated at SARC55 ($F_{40\%}=0.18$). Long-term projections at $F=0.18$ and $M=0.2$ were updated using the 1982-2011 recruitment series, producing estimates of rebuilding targets (the SSB_{MSY} proxy) of 47,184 mt (using the ASAP $M=0.2$ recruitment series) and 69,621 mt (ASAP M-ramp recruitment series).

The assessment indicates that the GOM cod stock is overfished and overfishing is occurring. This conclusion is robust to both assessment models ($M=0.2$ and M-ramp) as well as exploratory approaches examined at the peer review to the M-ramp reference points. Spawning stock biomass (SSB) in 2013 is estimated to be below 2,500 mt under both models and at 4% or 3% of the SSB_{MSY} proxy (47,184 mt or 69,621 mt) in the $M=0.2$ or M-ramp models, respectively. The 2013 fully selected fishing mortality is estimated to be greater than 1.2 under both models, while the F_{MSY} proxy is 0.18 for both models. Furthermore based on the exploratory analyses at the peer review, fully-recruited F in 2013 was well above the F_{MSY} proxy, and 2013 SSB was far below the SSB_{MSY} proxy.

Fishing mortality is near all time highs despite fishery catches among the lowest in the time series. Survey indices are at time series lows. Recent recruitment is weak to low, and declining spawning stock biomass and truncation of the age-structure could compromise the future recruitment success of this stock. Furthermore, the stock projections may be optimistic. The potential for a regime shift (i.e., increased natural mortality in recent years), as previously considered in SARC 55, and its impact on the stock was also further discussed by the peer review panel. The Gulf of Maine cod stock is in poor condition.

The GOM cod ABC for FY 2014 (1,550 mt) exceeds the overfishing threshold of $F=0.18$. To avoid exceeding the projected OFL (harvest at $F_{MSY-proxy}=0.18$), catches would need to be substantially decreased. To meet rebuilding targets (rebuild to SSB_{MSY} by 2024), 2015 catches would need to be reduced considerably lower than the current ABC of 1,550 mt.

Catch Projections

Projections assumed 1982-2011 median recruitment ($M=0.2$ ~ 4.6 million fish, $M-ramp$ ~ 9.1 million fish) consistent with the guidance from SARC 55. The projections generally used the same recruitment protocol presented at SARC 55, however, it adopted a slightly modified protocol for the “hockey stick” approach. The previous protocol set the hinge point of the spawner-recruit relationship at the lowest SSB observed. For the update, the hinge point was not modified from that used in SARC55, in recognition of the lower recruitments observed in recent years. Furthermore, the time period used to estimate age 1 recruitment in year $t+1$ was modified from using the geometric mean of the previous 10 years to using the geometric mean of only the last 5 years in an effort to better characterize recent lower recruitment patterns.

The peer review panel recommended conducting three different projections assuming 75% F_{MSY} for each model for catches in 2015-2017. The $M=0.2$ model assumed that $F_{MSY}=0.18$, $SSB_{MSY}=47,184$. The two $M-ramp$ projections differed in their assumptions about future mortality rates. Both used reference points based on $M=0.2$: $F_{MSY} = 0.18$ and $SSB_{MSY} = 69,621$.

Projections:

- *the $M=0.2$ model;*
- *the $M-ramp$ $M=0.2$ model, assuming mortality will return to base levels of $M=0.2$; and*
- *the $M-ramp$ $M=0.4$ model, assuming mortality will remain at 0.4 through the 10 year rebuilding period.*

PDT Analysis, Results, and Discussion

Analysis: Projection Assumptions

The PDT assumed the 2014 ABC for GOM cod catch for each projection and corresponding OFLs were calculated for each projection.

Results: Candidate GOM cod ABCs/OFLs

Table 1 summarizes the candidate ABCs three projections assuming a catch of 1,550 mt in 2014 (the ABC). Table 2 provides the corresponding OFLs after imputing the candidate ABCs.

Table 1: Summary of candidate ABCs.

year	ABC (M=0.2)	ABC (M-ramp M=0.2)	ABC (M-ramp M=0.4)
2015			
2016			
2017			

Table 2: Summary of candidate OFLs

year	OFL (M=0.2)	OFL (M-ramp M=0.2)	OFL (M-ramp M=0.4)
2015			
2016			
2017			

Discussion: Assessment Findings and Comparison of ABCs

There are several sources of uncertainty in the 2014 assessment including ...

- Concentration of the stock
- Recruitment
- Stock rebuilding XXX
- Depensation/Allee effect
- Environment
- M=0.4 – biological implications
- Next scheduled update
- XXX
- XXX
- XXX

Consequence Analysis???

PDT Recommendation

The PDT recommends that for the GOM cod stock that the XXX projection run should be used for setting FY 2015-FY2017 ABCs.

- XXX
- XXX
- XXX
- XXX
- XXX

Tables

Figures