



New England Fishery Management Council

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MEMORANDUM

DATE: May 1, 2013
TO: Scientific and Statistical Committee (SSC)
FROM: Phil Haring, Monkfish Plan Development Team (PDT) Chair
SUBJECT: PDT calculations and comments on monkfish reference points

On April 30, 2013, the Monkfish PDT convened to review the recent stock assessment update, provide comments and background information to the SSC for its development of recommendations to the Council on Allowable Biological Catch (ABC) for the monkfish fishery. In preface, readers should be aware that the PDT's efforts were hampered by lack of an assessment report (since it had not been finalized as of the meeting) and associated reviewer comments, which also had not yet been compiled. In light of that, some PDT members agreed that the following quote from the statistician, John Tukey, would be an appropriate way to introduce this discussion summary:

The data may not contain the answer... the combination of some data and an aching desire for an answer does not ensure that a reasonable answer can be extracted from a given body of data. **Sunset salvo. The American Statistician 40 (1)**

That said, the PDT did have available some summary data which enabled it to perform the necessary calculations, and to develop commentary on the results.

Calculation of the overfishing limit (OFL)

OFL, based on the control rule adopted in Amendment 5, is defined as the product of the fishing mortality threshold (F_{max}) and the current estimate of exploitable biomass. Based on the draft assessment results, $F_{max} = 0.44$ and 0.37 , for Northern and Southern stock components, respectively. The terminal year (2011) estimates of exploitable biomass are 44,730 mt and 98,450 mt, North and South. The PDT also projected an estimate of exploitable biomass at the start of 2014 by applying the status quo (2011) F to the terminal year exploitable biomass from the assessment in order to provide the SSC with

an alternative to using what will be a 3-year-old OFL estimate by the time it takes effect. The PDT cautions, however, that neither method resolves the inherent uncertainty in the OFL values.

Further, the estimate of exploitable biomass at the start of 2014 is based upon a projection from the SCALE model, a model that has demonstrated an optimistic retrospective pattern in the past. The PDT could not come to consensus on whether to recommend using an admittedly older terminal year estimate of exploitable biomass, or one that is based on uncertain projections as the basis for determining OFLs for fishing years 2014-2016.

The following table provides the results of these calculations:

Area	Basis	Fmax	EB ₂₀₁₁ , mt	OFL mt
North	SCALE 2011 EB	0.44	44,730	13,907
	Projected 2014 EB status quo F		57,267	17,805
South	SCALE 2011 EB	0.37	98,430	26,542
	Projected 2014 EB status quo F		86,052	23,204

EB = exploitable biomass

OFL= Fmax * B current (exploitable biomass)

Options for calculation of Allowable Biological Catch (ABC)

As with OFL, the ABC control rule was adopted in Amendment 5, but the two differ in that the ABC control is not expressed simply as an equation. The following excerpt from Amendment 5 explains:

ABC is the level of catch that accounts for scientific uncertainty in the estimate of OFL and any other scientific uncertainty. NSI Guidelines state that the Council must establish an ABC control rule based on scientific advice from its SSC. Further, the guidelines prescribe that “the determination of ABC should be based, when possible, on the probability that an actual catch equal to the stock’s ABC would result in overfishing.

The SSC observed in its June 23, [2010, following SARC 50] report to the Council that “considerable uncertainties in the assessment model preclude its use to determine probability of exceeding the projected Overfishing Level of catch.” Therefore, the SSC recommended the method of determining ABC should be considered an interim proxy until Overfishing Level of catch and its uncertainty can be projected.

The SSC recommended [in March 2009, during the development of Amendment 5, and subsequently adopted by the Councils] that the interim ABC should be derived (ABC control rule) as:

the product of the average exploitation rate during the recent period of stable or increasing trend in biomass for each management unit and the most recent estimate of exploitable biomass.

Based on the results of SARC 50 (2010), the SSC reported to the Councils in September 2010 the following:

Using average exploitation rates during the most recent periods of biomass increase (2006-2009 in the northern area; 2002-2009 in the southern area) and the most recent estimate of exploitable biomass from SARC 50, 2010 ABC is 7,592 mt in the northern area and 12,316 mt in the southern area. These are about 40% and 34% of the OFLs for the northern and southern areas NMA and SMA respectively and highlight the large uncertainties in the assessments.

Based the 2013 assessment update, the PDT calculated the ABC options in the same way it did for the OFL options, i.e., using the terminal year results for exploitable biomass, and projecting exploitable biomass to 2014 by applying the status quo Fs. The PDT also updated the period used to derive the applicable exploitation rate under the control rule language to 2006-2011 (North) and 2002-2009 (South), noting that the assessment showed a decline in southern area biomass in 2010 and 2011, despite the relatively low Fs. A member of the PDT suggested that the period of “stable or increasing trend in biomass” is somewhat subjective, and that the declines in 2010 and 2011 may just natural variability, as might be expected, rather than a real change in biomass trajectory, which could be better confirmed by additional data points.

The following table summarizes the PDT’s calculation of the ABC options, and includes an updated calculation of the MSY proxy for reference:

Area	Basis	F _{threshold}	M	U	B _{target} ¹	B _{threshold}	Exploitable B 2011, mt	MSY proxy ²	OFL ³	F _{abc} ⁴	U _{abc}	ABC	ABC/OFL
North	SCALE 2011 EB	0.44	0.30	0.311	46,074	23,037	44,730	9,383	13,907	0.25	0.19	8,601	0.62
	Projected 2014 EB status quo F						57,267		17,805			11,012	
South	SCALE 2011 EB	0.37	0.30	0.270	71,667	35,834	98,430	14,328	26,542	0.13	0.11	10,400	0.39
	Projected 2014 EB status quo F						86,052		23,204			9,092	
EB = exploitable biomass													
¹ total biomass, 2013 assessment, longterm projected biomass at F _{msy} proxy (=F _{max})													
² catch produced from F _{max} at B _{target} , 2013 assessment update													
³ F _{max} * B current (exploitable biomass)													
⁴ F _{abc} =F during recent increases in biomass North: 2006-2011 South: 2002-2009													
* ACT based on buffers from Amendment 5 and FW7													

It is noted here that the MSY proxies calculated by the PDT following SARC 50 (2010) were 10,745 mt (North) and 15,279 mt (South).

In its March 30, 2009 report for the development of the original reference point control rules, the SSC commented that “the data-poor default method for determining an interim ABC produces catch advice that is substantially less than the nominal OFL, but is not directly associated with overfishing (i.e., it is not directly based on OFL and its uncertainty).” The SSC stated that it will re-consider ABC recommendations based on updated information. The most recent assessment update does not provide any additional quantification of the elements of uncertainty in the estimate of OFL.

Throughout its discussion, the PDT continually pointed out the high degree of uncertainty in these numbers and its impact on their application to management, both those in the terminal year of the assessment, and, additionally, when using values projected to 2014. Even using just the terminal year values, one member questioned the logic of having a northern area ABC roughly 90% of the southern area ABC when the total northern area biomass is roughly $\frac{1}{2}$ of the southern area total biomass.