Scientific Information Available to Support Increases in Annual Catch Limits for New England Groundfish

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Summary

Scientific information is available to support increased Annual Catch Limits (ACLs) for New England groundfish that do not undermine conservation mandates of the Magnuson Act. A review of scientific analyses used to derive ACLs finds that several decisions favored relatively low ACLs, and scientifically valid alternatives may be available for: 1) direct estimates of F_{MSY}, 2) alternative stock assessment models, 3) smaller uncertainty buffers, and 4) revised rebuilding objectives. Alternative scientific decisions would support increases in ACLs for all New England groundfish stocks, with substantial increases for 'choke stocks' such as Georges Bank yellowtail flounder, Georges Bank cod, Gulf of Maine cod, Gulf of Maine winter flounder, and southern New England winter flounder. Increased ACLs for 'choke stocks' are expected to allow the fleet to achieve more of their allocation of other stocks, thereby substantially increasing mixed-stock economic yield.

Objective

This document provides information that can be considered to support Governor Patrick's and Representative Frank's conclusion that increased ACLs can be scientifically justified.

On October 1 Governor Deval Patrick requested Secretary of Commerce Gary Locke to adjust Annual Catch Limits. He wrote, *"My team will be in touch with your General Counsel to work on the development of a legally and scientifically sound path to raise catch limits to the maximum possible extent within the constraints of the Magnuson-Stevens Act."* This request followed the Secretary's visit to the Commonwealth where he met with Governor Patrick to hear concerns about *"severe economic impacts and increasing bankruptcies among small family fishermen due to unnecessarily low limits."*

On October 14, Secretary Locke wrote to Representative Barney Frank, "*I am prepared to issue an emergency regulation to revise catch limits whenever there is both sufficient economic and sound scientific data available to meet these requirements. You have graciously offered to provide scientific and economic information that could support the exercise of the emergency rule authority in response to the current situation in New England.*"

Background

National Standard 1 of the 2007 Magnuson-Stevens Fishery Conservation and Management Act requires that "*Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry*" (US DOC 1976). The 2007 reauthorization of the Magnuson Act introduced the requirement for annual catch

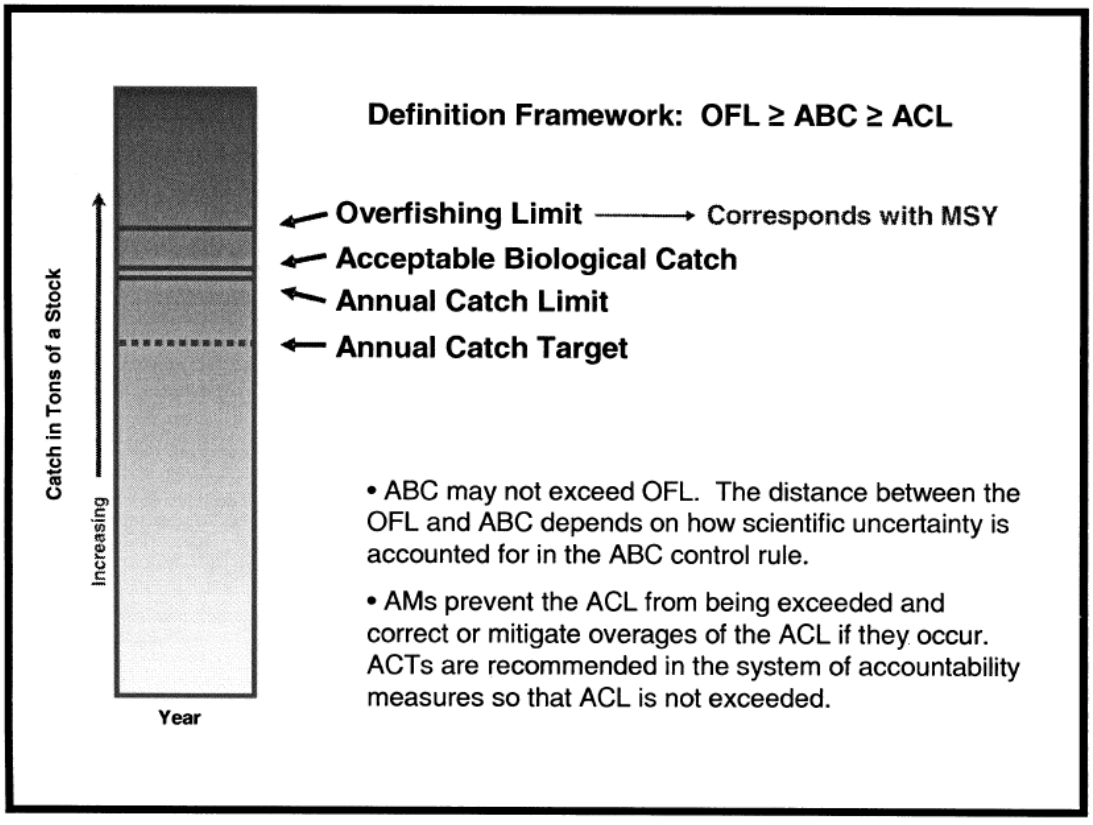
limits and accountability measures: "*Each Council shall… establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability*" (US DOC 2007). Overfishing is defined in the Magnuson Act as the "*rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis*" (i.e., F_{MSY}).

National Standard Guidelines suggest: a) that Annual Catch Limits (ACLs) be based on an estimate of the magnitude of catch that will result in overfishing and associated uncertainty in the estimate, and b) ACL cannot exceed Acceptable Biological Catch (NOAA 2009[1]).

In practice, Acceptable Biological Catch is derived from three components:

1. the overfishing reference point,
2. the projected estimate of stock size, and
3. a buffer to account for scientific uncertainty

Additionally, Acceptable Biological Catch needs to allow rebuilding objectives to be achieved. Fishing mortality needs to be reduced to less than F_{MSY} to allow 'overfished' stocks to rebuild.



Relationship between the overfishing limit, acceptable biological catch and the annual catch limit (from National Standard Guidelines, NOAA 2009)

[1] National Standard guidelines do not have the force and effect of law

Existing Information to Support Increased ACLs

Scientifically valid alternatives may be available for each component of Acceptable Biological Catch to allow increases in ACLs:

1. **Direct estimates of F_{MSY} would allow several increases in groundfish ACLs.** In 2002, F_{MSY} was estimated for all New England groundfish stocks using several modeling approaches, and the 'best model' was determined using conventional model selection methods (NEFSC 2002). Although a direct estimate of F_{MSY} was determined for some stocks, a proxy for F_{MSY} ($F_{\%MSP}$, the fishing mortality associated with a percentage of maximum spawning potential) was used for most stocks. All F_{MSY} estimates were replaced with $F_{\%MSP}$ at the 3rd Groundfish Assessment Review Meeting (NEFSC 2008). Considering that F_{MSY} is the legal definition of overfishing, the overfishing limits of Gulf of Maine cod, Georges Bank cod, Georges Bank yellowtail, southern New England yellowtail, Gulf of Maine winter flounder, southern New England winter flounder, and white hake are underestimated, and associated ACLs can be justifiably increased.
2. **Alternative assessments would allow further increases in groundfish ACLs.** Several alternative stock assessment approaches were developed for the 3rd Groundfish Assessment Review Meeting (NEFSC 2008). Several models had substantial uncertainty manifest by retrospective inconsistency. The Review Panel chose some models that either adjusted estimates for retrospective inconsistency or reduced retrospective inconsistency by assuming that survey efficiencies changed in the mid 1990s. 'Base case' models (with no retrospective adjustment or revised survey assumptions) estimated greater stock sizes. For example, if 'base case' stock assessments were used to determine stock status of Gulf of Maine winter flounder, the stock would not be considered overfished. Although 'base case' models have diagnostic problems, they are the simplest analyses of all available data, and they were the method used to assess principal groundfish stocks for decades. By comparison, split survey models imply substantial increases in survey efficiencies (some greater than 100%); and adjusted models account for a potential bias that is not understood and may not persist. Retrospective adjustments are justified by some persistent retrospective patterns that caused management errors (e.g., Georges Bank yellowtail flounder). Conversely, retrospective patterns of other stocks have ceased or reversed direction (e.g., southern New England yellowtail and Cape Cod yellowtail), in which case a retrospective adjustment would have been inappropriate. Other alternative estimates of stock size are also available for some stocks that would justify increases in ACLs. For example, the alternative assessment of Georges Bank yellowtail that includes large survey tows provides an estimate of stock size that is nearly twice as large as the split survey series model (Legault et al. 2010). Similarly, swept-area survey estimates of the Gulf of Maine winter stock provide a method for deriving greater catch limits (Groundfish PDT 2010).
3. **Smaller buffers would allow further increases in groundfish ACLs.** Acceptable Biological Catch for most New England groundfish stocks is based on $75\%F_{MSY}$, because uncertainty could not be reliably estimated by groundfish stock assessments, providing a 25% buffer between the overfishing limit and the Acceptable Biological Catch to account for scientific uncertainty. A recent $75\%F_{MSY}$ projection analysis found that probability of overfishing was less than 10% (pollock, NEFSC 2010, Groundfish PDT 2010), which is less than the acceptable range of risk determined by several regional

management Councils (Witherell 2010). Similar analyses for other groundfish stocks should be investigated to determine the probability of overfishing at 75%F_{MSY}. Smaller buffers may have more acceptable levels of risk, and Acceptable Biological Catches based on 75%F_{MSY} can be increased up to 33%, and still conform to the maximum sustainable yield definition in the Magnuson Act. Although uncertainty buffers are recommended by NS1 guidelines, NMFS has supported minimal buffers in other regions (e.g., <1% buffer for Alaskan crabs supported by the Northwest Regional Office; NPFMC 2010).

4. **Revised rebuilding objectives would allow increases in groundfish ACLs.** Acceptable Biological Catch of some stocks is based on rebuilding objectives. As illustrated for Georges Bank yellowtail flounder, Acceptable Biological Catch can increase if rebuilding objectives are revised (Groundfish PDT 2010). Rebuilding plans can be revised by increasing the rebuilding period, using a direct estimate of B_{MSY} rather than a proxy, or reducing the expected probability of achieving objectives to 50%. The best estimates of B_{MSY} (i.e., those associated with the best estimates of F_{MSY}) are greater than the rebuilding target for Georges Bank yellowtail, southern New England yellowtail, southern New England winter flounder, and white hake. Additionally, if 'base case' stock assessments were used to determine stock status of Georges Bank yellowtail and southern New England winter flounder, Acceptable Biological Catch associated with rebuilding would be much greater. Determining the magnitude of ACL increases allowed by revised stock size or rebuilding targets would require revised projection analysis.

An important consideration in selecting the most appropriate scientific information to derive ACLs is the chronological development of scientific information in the context of revised mandates and guidelines. The 2002 re-evaluation of overfishing definitions and the 2008 stock assessments were completed before National Standard guidelines were published, and the system for incorporating scientific uncertainty could not be considered by the 2002 working group or the 2008 review panel. The new ACL system requires that a) the estimate of catch associated with overfishing should be risk-neutral (i.e., neither risk-averse nor risk-prone); and b) scientific uncertainty and fishery managers' consideration of risk should be accounted for in the Acceptable Biological Catch (NOAA 2009). Some analytical choices associated with F_{MSY} and stock assessment models may be risk-averse rather than risk-neutral (e.g., choice of $F_{\%MSP}$ as a F_{MSY} proxy, retrospective adjustments, split survey series, exclusion of large survey tows). In the context of the new management system, adding an uncertainty buffer to an overfishing limit that is based on an underestimate of F_{MSY} or stock size is doubly precautious. Therefore, reconsideration of ACLs may be justifiable, based on direct F_{MSY} and B_{MSY} estimates, alternative stock assessments, or narrower uncertainty buffers.

Although the potential increases from each component of Acceptable Biological Catch should be considered separately, the mathematical relationship between the overfishing definition, stock size estimate, and uncertainty buffer in deriving Acceptable Biological Catch implies that multiple sources of increase are multiplicative. Combined adjustments provide increases in ACLs for all New England groundfish stocks, with substantial increases for 'choke stocks' such as Georges Bank yellowtail flounder, Georges Bank cod, Gulf of Maine cod, Gulf of Maine winter flounder, and southern New England winter

flounder. Increased ACLs for 'choke stocks' are expected to allow the fleet to achieve their allocation of other stocks, thereby substantially increasing the mixed-stock yield within the multispecies ACLs.

Overfishing limits, Acceptable Biological Catch and ACLs can be increased using reference point estimates and stock size estimates from existing scientific documents. Other alternative estimates of F_{MSY} or stock size are also possible, and may allow further increases in ACLs. Similar investigations of scientific information available to increase ACLs can be applied to other fishery management plans in New England. For example, the recent determination that winter and little skates are rebuilt suggests that the 20,000lb trip limit allowed recovery of the two target skate species, and the current 500lb trip limit can be relaxed to increase landings and decrease skate discards. The current ACLs pose substantial economic costs and losses to fishing communities (NEFMC 2009, NOAA 2010), and these losses can be mitigated by increasing ACLs within the limits of sustainability and sound scientific information that exists today.

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Glossary

Acceptable Biological Catch (ABC): a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and should be specified based on the ABC control rule.

Accountability Measures (AMs): management controls that prevent ACLs or sector ACLs from being exceeded (in-season AMs), where possible, and correct or mitigate overages if the occur.

Annual Catch Limit (ACL): the level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures.

Annual Catch Target (ACT): an amount of annual catch of a stock or stock complex that is the management target of the fishery. A stock or stock complex's ACT should usually be less than its ACL and results from the application of the ACT control rule. If sector ACL's have been established each one should have a sector ACT.

Optimum Yield (OY): The term "optimum", with respect to the yield from a fishery, means the amount of fish which -

> (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
> (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and
> (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfishing: "overfishing" and "overfished" mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.

Overfishing Limit (OFL): the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers of weight of fish.

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