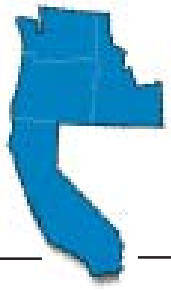

Pacific Fishery Management Council

Information Sheet:

Questions and Answers About Rebuilding Plans

First, some context...

The Pacific Fishery Management Council (Council) recommends management measures for ocean fisheries in federal waters (3-200 miles) off Washington, Oregon, and California. Management measures are embodied in fishery management plans (FMPs) for salmon, groundfish, highly migratory species (like tunas and sharks), and coastal pelagic species (like sardines, anchovies, and squid). The groundfish FMP covers more than 82 species, of which eight are currently designated as overfished. These eight are lingcod, cowcod, bocaccio, Pacific ocean perch, yelloweye rockfish, canary rockfish, darkblotched rockfish, and widow rockfish.

When were these species designated as overfished?

Lingcod, Pacific ocean perch, and bocaccio were designated overfished in 1999; canary rockfish and cowcod in 2000; darkblotched rockfish and widow rockfish in 2001; and yelloweye rockfish in 2002. (Although Pacific whiting were declared overfished in 2002, a more recent assessment shows that this species is not overfished. In response, NMFS removed it from the list of overfished species in 2004.)

When is a stock declared overfished?

A stock is declared "overfished" by the National Marine Fisheries Service (NMFS) when its population size decreases to a certain level. For groundfish, this level is 25% of the population's "unfished biomass," or the size the stock would be if there were no fishing. This is referred to as $B_{25\%}$, with the B standing for the biomass of mature females, who represent the production potential of the stock.

What is the Council doing about overfishing?

The Council and NMFS have implemented management policies to reduce catches of overfished species to a level that will allow their populations to rebuild to a healthy size. The process of rebuilding is guided by rebuilding plans covering each of the eight overfished species. The Council first amended (changed) the Pacific Coast Groundfish FMP in 2000 to describe how rebuilding plans would be developed. However, this approach was invalidated in a Federal court case. The judge ruled that according to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (the main federal law regulating ocean fisheries in the United States), a rebuilding plan must be in the form of an FMP, an amendment to an FMP, or Federal regulations, which was not a requirement of the 2000 FMP amendment. So in 2003 the Council amended the Groundfish FMP

again. With this second change, information about how the Council proposes to rebuild each overfished species is added to the FMP. Key numerical values used to compute harvest levels for overfished species are also added to Federal regulations.

The Council has adopted rebuilding plans for all eight overfished species. Four of these plans—for canary rockfish, darkblotched rockfish, lingcod, and Pacific ocean perch—were approved by NMFS in early 2004 and have been fully implemented. Plans for bocaccio, cowcod, widow rockfish, and yelloweye rockfish were adopted by the Council in April 2004 and should be implemented by NMFS before the end of the year.

How dangerous is it for a stock to be "overfished"?

Although a fish stock is larger when no fishing occurs, fish stocks are more productive (that is, more fish are produced, they grow faster, or they mature earlier) when some level of fishing (or other form of population control) takes place. In part, this is because there is less competition among fish for resources. In an unfished stock, net productivity is lower because the population reaches a point where growth, competition, and mortality are in rough balance. Most fish populations can be fished well below their unfished biomass level and still be sustained and capable of returning to their unfished status. For most groundfish, catches occur when the population is around a third to half of its unfished level. When a rockfish population is reduced from 40% to 25% of its unfished biomass, the level of catch that is sustainable declines. As stock size shrinks due to overfishing or other factors, productivity also decreases because there are not enough adult fish to produce sufficently large numbers of offspring. When the population drops below 25% of its unfished biomass, there is danger that it will take a long time to recover to an optimally sustainable level.

What is a rebuilding plan?

A rebuilding plan is a strategy to limit fishing so that an "overfished" stock can increase its abundance, growing to a legally-mandated target level. A larger, healthier stock will allow more catch in the future. The MSA requires that fishery management councils create and put into effect measures to rebuild overfished stocks. The MSA contains ten "National Standards" relating to how fisheries should be managed. The first National Standard states, "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." NMFS created guidelines to interpret exactly what this and other National Standards mean. The guidelines for National Standard One describe how rebuilding should occur. Federal fishery managers (that is, Councils and NMFS) must:

- prevent overfishing and achieve "optimum yields" on a continuing basis; and
- implement conservation and management measures to rebuild affected stocks. Among other things, rebuilding plans address stock size, the time needed to rebuild, and the annual catch that allows stock size to increase from its current level to the target level.

What is the goal in rebuilding stocks?

Definitions

MSY	Maximum sustainable yield. The largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions.
B_{MSY}	The biomass that allows maximum sustainable yield to be taken.
$B_{25\%}$	One quarter of the unfished biomass. For groundfish, this is the threshold for an "overfished" designation.

The goal in rebuilding stocks is to grow them to a size that will support the largest sustainable catch, called "maximum sustainable yield" (MSY). MSY is a central concept in fisheries management. Defined as "the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions," MSY is usually produced by a biomass that is around a third to half of the unfished stock size. The target stock size for rebuilding is called B_{MSY}.

How are rebuilding times set?

Rebuilding plans must increase stocks to this B_{MSY} level, and they must do so within the time constraints established by the Magnuson-Stevens Act and the National Standard Guidelines. In general, managers should strive to rebuild stocks as quickly as possible, taking into consideration the biology of the fish stock and effects on fishing communities. The shortest time to rebuild would occur when all fisheries were completely closed, even those that rarely catch one of the fish in question. Therefore, the rebuilding times may be greater than the minimum possible in order to lessen economic harm to fishers and fishing communities.

Definitions

T_{TARGET}	The target year, set by policy, for a fish stock to be completely rebuilt.
T_{MIN}	The minimum amount of time in which a fish stock will have a 50% chance of rebuilding if no fishing occurs (depends on biological and environmental factors).
F=0	Fishing mortality equals zero (no fishing).
T_{MAX}	The maximum amount of time in which a fish stock can rebuild (depends on biological, environmental, and legal/policy factors).

The target year for rebuilding a fish stock is called T_{TARGET}. T_{TARGET} is the time required for the stock to have a 50% chance of reaching its target size, given a certain amount of fishing. (For more discussion of rebuilding probabilities, see the fact sheet entitled "Understanding Rebuilding Analyses.") Two time limits are used to determine this target. The minimum time limit is how long it would take for the

stock to have a 50% chance of rebuilding if no fish were caught. This is referred to as T_{MIN}. If this is less than ten years, then the maximum time limit for the stock to rebuild, called T_{MAX}, must be ten years or less.

However, some fish stocks (like rockfish) are biologically incapable of rebuilding in ten years or less, even if no fishing occurs. Under these circumstances, the guidelines allow an alternative time limit (T_{MAX}, or the longest time allowed to rebuild). It is "one mean generation time" added to T_{MIN}. One mean generation time is a measure of how long it takes, on average, for a sexually mature female fish to be replaced by offspring with the same spawning capacity. For example, without any fishing, the widow rockfish population (declared overfished in 2001) would be expected to recover to its target biomass (B_{MSY}) in 2023. This is T_{MIN}. With a mean generation time of 16 years, managers must manage fishing so the stock recovers no later than 2039, which is T_{MAX} (or T_{MIN} plus 16).

Managers usually choose a target date between T_{MIN} and T_{MAX} based on the tradeoff between conservation and the economic and social costs of reducing fish catches in the short term. Choosing this timeframe can be difficult and controversial. If managers choose a very early target date (only a few years after the lower time limit, T_{MIN}), then almost all fishing may have to be halted in order for the stock to recover. This is likely to be hard on people in the commercial and recreational fishing communities. On the other hand, if managers opt for a target year far in the future (very close to the upper time limit, T_{MAX}), it will take longer for the population to rebuild and for fish harvests to return to higher, sustainable levels. Choosing the target year depends on finding a balance between socioeconomic and environmental costs and benefits. The amount of fishing that can be sustained while aiming for a particular target year also depends on fish biology and other environmental factors, such as El Niño oceanographic events or exceptionally high ocean productivity.

What is the "Mixed Stock Exception"?

In "mixed-stock complexes," many species of fish swim together and are caught together. This becomes a problem when some of these stocks are healthy and some are overfished, because even a sustainable harvest of the healthy stocks can harm the depleted stock. In order to avoid having to shut down all fisheries to protect one particular overfished stock, the National Standard Guidelines allow a "mixed-stock" exception to the "overfished" definition.[1/] This would allow higher catches of some overfished species than ordinarily allowed in order to avoid severe hardship to fishing communities.

Use of the mixed stock exception is discouraged, and is to be considered only when normal fishery management measures are unsuccessful. The Pacific Council has not used the mixed stock exception in its rebuilding plans.

[1/] Federal Code of Regulations: 50 CFR 600.310(d)(6)

What are the Targets in the Pacific Council Rebuilding Plans?

Parameters such as T_{MIN}, T_{MAX}, and B_{MSY}, defined in the previous section, set limits on what strategy the Council may choose to rebuild an overfished stock. The Council chooses two "strategic rebuilding parameters"—T_{TARGET} and a fishing rate (known as the "harvest control rule")—to define how NMFS and the Council propose to rebuild each overfished species. For each species a given target year dictates what the harvest rate, or harvest control rule, may be. Scientists use this strategic parameter to calculate the harvest level that can be sustained each year while still ensuring a good chance the fish stock will recover by the target year. When deciding what T_{TARGET} should be for an overfished species the Council uses another number, the rebuilding probability (P_{MAX}), as a guide. For a given harvest rate, P_{MAX} is a measure of how likely it is that the overfished species will recover. Decision makers can use P_{MAX} to compare the long-term risk that the stock may not rebuild to the short-term cost reflected in the harvest levels that are required in the near term. (For a more detailed discussion of P_{MAX} and other rebuilding parameters see the Council's *Understanding Rebuilding Analyses* fact sheet.) The parameters in the eight adopted rebuilding plans are shown in the table below.

	Bocaccio	Canary Rockfish	Cowcod	Darkblotched Rockfish*	Lingcod	Pacific Ocean Perch*	Widow Rockfish	Yelloweye Rockfish
T_{MIN}	2018	2057	2062	2011	2007	2011	2026	2027
T_{TARGET}	2023	2074	2090	2030	2009	2027	2038	2058
T_{MAX}	2032	2076	2099	2044	2009	2042	2042	2071
P_{MAX}	70%	60%	60%	>90%	60%	>70%	60%	80%
Harvest Control Rule**	5%	2%	1%	3%	5-6%	3%	1%	2%

*Updated values

**Approximate value of the exploitation rate, or maximum percent of the harvestable population that may be caught in one year.

The values of these parameters depend on our understanding of the productivity of the overfished species. A more productive population can sustain higher catch rates and still rebuild; the opposite is true for a less productive population. As new information becomes available, it is likely that the measured productivity of an overfished population will change, affecting the values of the parameters listed above. According to the Groundfish FMP, the strategic rebuilding parameter values published in Federal regulations (T_{TARGET}, and the harvest control rule) must then be changed. Normally, any such change is made as part of the process NMFS and the Council go through to set harvest levels and implement new management measures, which happens every two years. Except in very unusual circumstances, the harvest control rule would be changed to ensure that the rebuilding target is met. Only if our understanding of the stock changes radically would T_{TARGET} be changed. As part of the harvest specifications process, changes to these strategic rebuilding parameters are subject to an environmental impact analysis and public review. The harvest control rules for darkblotched rockfish and Pacific ocean perch have already been changed since the Council adopted those rebuilding plans in June 2003. New stock assessments resulted in a recalculation of the harvest control rule values, and the new values were published in Federal regulations when implementing groundfish management measures for 2004.

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