PACIFIC COAST GROUNDFISH
FISHERY MANAGEMENT PLAN

FOR THE CALIFORNIA, OREGON, AND
WASHINGTON GROUNDFISH FISHERY

AS AMENDED THROUGH AMENDMENT 1923
INCLUDING AMENDMENTS 15 AND 24

PACIFIC FISHERY MANAGEMENT COUNCIL
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Objective 15. Avoid unnecessary adverse impacts on small entities.

Objective 16. Consider the importance of groundfish resources to fishing communities, provide for the sustained participation of fishing communities, and minimize adverse economic impacts on fishing communities to the extent practicable.

Objective 17. Promote the safety of human life at sea.

[Amended; 7, 11, 13, 16-1, 18, 16-4]

2.2. Operational Definition of Terms

Acceptable Biological Catch (ABC) is a biologically-based estimate of the amount of fish that may be harvested from the fishery each year without jeopardizing the resource. It is a seasonally determined catch that may differ from MSY for biological reasons. It may be lower or higher than MSY in some years for species with fluctuating recruitment. The ABC may be modified to incorporate biological factors and risk assessment due to uncertainty. Lacking other biological justification, the ABC is defined as the MSY exploitation rate multiplied by the exploitable biomass for the relevant time period harvest specification that is set below the overfishing limit to incorporate a scientific uncertainty buffer against exceeding the overfishing limit.

Accountability Measures (AMs) are management controls, such as inseason adjustments to fisheries or annual catch targets, to prevent annual catch limits, including sector-specific annual catch limits, from being exceeded, and to correct or mitigate overages of the annual catch limit if they occur. Accountability measures should address and minimize both the frequency and magnitude of overages and correct the problems that caused the overage in as short a time as possible.

Annual Catch Limit (ACL) is a harvest specification set equal to or below the acceptable biological catch threshold in consideration of conservation objectives, socioeconomic concerns, management uncertainty, and other factors. All sources of fishing-related mortality including landings, discard mortality, research catches, and catches in exempted fishing permit activities are counted against the annual catch limit. Sector-specific annual catch limits can be specified, especially in cases where a sector has a formal, long-term allocation of the harvestable surplus of a stock or stock complex.

Annual Catch Target (ACT) is a harvest specification set below the annual catch limit and is used as an accountability measure in cases where there is great uncertainty in inseason catch monitoring to ensure against exceeding an annual catch limit. Since the annual catch target is a target and not a limit it can be used in lieu of harvest guideline or strategically to accomplish other management objectives. Sector-specific annual catch targets can also be specified to accomplish management objectives.

Biennial fishing period is defined as a 24-month period beginning January 1 and ending December 31.

Bottom (or flatfish bottom) trawl is a trawl in which the otter boards or the footrope of the net are in contact with the seabed. It includes roller (or bobbin) trawls, Danish and Scottish seine gear, and pair trawls fished on the bottom.

Bottom-contact gear by design, or as modified, and through normal use makes contact with the sea floor.
Bycatch means fish which are harvested in a fishery, but which are not sold or kept for personal use and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

Chafing gear is webbing or other material attached to the codend of a trawl net to protect the codend from wear.

Charter fishing means fishing from a vessel carrying a passenger for hire (as defined in section 2101(21a) of title 46, United States Code) who is engaged in recreational fishing.

Closure, when referring to closure of a fishery, means that taking and retaining, possessing or landing the particular species or species complex is prohibited.

Council means the Pacific Fishery Management Council, including its Groundfish Management Team (GMT), Scientific and Statistical Committee (SSC), Groundfish Advisory Subpanel (GAP), and any other committee established by the Council.

Commercial fishing is (1) fishing by a person who possesses a commercial fishing license or is required by law to possess such license issued by one of the states or the federal government as a prerequisite to taking, landing, and/or sale; or (2) fishing which results in or can be reasonably expected to result in sale, barter, trade, or other disposition of fish for other than personal consumption.

Density dependence is the degree to which recruitment declines as spawning biomass declines. Typically we assume that a Beverton-Holt form is appropriate and that the level of density-dependence is such that the recruitment only declines by ten percent when the spawning biomass declines by 50%.

Double-walled codend is a codend constructed of two walls of webbing.

Economic discards means fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, quality, or for other economic reasons.

Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Exploitable biomass is the biomass that is available to a unit of fishing effort. Defined as the sum of the population biomass at age (calculated as the mean within the fishing year) multiplied by the age-specific availability to the fishery. Exploitable biomass is equivalent to the catch biomass divided by the instantaneous fishing mortality rate.

F is the instantaneous rate of fishing mortality. F typically varies with age, so the F values are presented for the age with maximum F. Fish of other ages have less availability to the fishery, so a unit of effort applies a lower relative level of fishing mortality to these fish.

F_{MSY} is the fishing mortality rate that maximizes catch biomass in the long term.

F_{10} is the fishing mortality rate at which a change in fishing mortality rate will produce a change in yield per recruit that is ten percent of the slope of the yield curve at nil levels of fishing mortality.

F_{OF} is the rate of fishing mortality defined as overfishing.
\( F_{\text{50\%}} \) is the rate of fishing mortality that will reduce female spawning biomass per recruit to \( x \) percent of its unfished level. \( F_{\text{100\%}} \) is zero, and \( F_{\text{35\%}} \) is a reasonable proxy for \( F_{\text{MSY}} \).

**Fishing** means (1) the catching, taking, or harvesting of fish; (2) the attempted catching, taking, or harvesting of fish; (3) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or (4) any operations at sea in support of, or in preparation for, any activity described above. This term does not include any activity by a vessel conducting authorized scientific research.

**Fishing year** is defined as January 1 through December 31.

**Fishing community** means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economy needs and includes fishing vessel owners, operators, crew, and recreational fishers and United States fish processors that are based in such community.

- **Fixed gear** (anchored non-trawl gear) includes longline, trap or pot, set net, and stationary hook-and-line gear (including commercial vertical hook-and-line) gears.

- **Gillnet** is a single-walled, rectangular net which is set upright in the water.

**Harvest guideline (HG)** is an specified numerical harvest objective which is not a quota. Attainment of a HG does not require closure of a fishery.

- **Hook-and-line** means one or more hooks attached to one or more lines. Commercial hook-and-line fisheries may be mobile (troll) or stationary (anchored).

**Incidental catch** or **incidental species** means groundfish species caught when fishing for the primary purpose of catching a different species.

**Individual fishing quota (IFQ)** means a federal permit under a limited access system to harvest a quantity of fish expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person.

- **Longline** is a stationary, buoyed, and anchored groundline with hooks attached, so as to fish along the seabed.

**Maximum sustainable yield** is an estimate of the largest average annual catch or yield that can be taken over a significant period of time from each stock under prevailing ecological and environmental conditions. It may be presented as a range of values. One MSY may be specified for a group of species in a mixed-species fishery. Since MSY is a long-term average, it need not be specified annually, but may be reassessed periodically based on the best scientific information available.

**Midwater (pelagic or off-bottom) trawl** is a trawl in which the otter boards may occasionally contact the seabed, but the footrope of the net remains above the seabed. It includes pair trawls if fished in midwater. A midwater trawl has no rollers or bobbins on the net.

**MSY stock size** means the largest long-term average size of the stock or stock complex, measured in
terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule in which the fishing mortality rate is constant. The proxy typically used in this fishery management plan is 40% of the estimated unfished biomass, although other values based on the best scientific information are also authorized.

Nontrawl gear means all legal commercial gear other than trawl gear.

Optimum yield means the amount of fish which will provide the greatest overall benefit to the U.S., particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems, 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 in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfished describes any stock or stock complex whose size is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding. The term generally describes any stock or stock complex determined to be below its overfished/rebuilding threshold. The default proxy is generally 25% of its estimated unfished biomass; however, other scientifically valid values are also authorized.

Overfishing means fishing at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. More specifically, overfishing is defined as exceeding a maximum allowable fishing mortality rate. For any groundfish stock or stock complex, the maximum allowable mortality rate will be set at a level not to exceed the corresponding MSY rate (F_{MSY}) or its proxy (e.g., F_{35%}).

Overfishing limit (OFL) is a biologically based estimate of the amount of fish that may be harvested from the fishery each year without jeopardizing the resource. It is a seasonally determined catch that may differ from MSY for biological reasons. It may be lower or higher than MSY in some years for species with fluctuating recruitment. The OFL may be modified to incorporate biological safety factors and risk assessment due to uncertainty. Lacking other biological justification, the OFL is defined as the MSY exploitation rate multiplied by the exploitable biomass for the relevant time period.

Processing or to process means the preparation or packaging of groundfish to render it suitable for human consumption, retail sale, industrial uses, or long-term storage, including, but not limited to, cooking, canning, smoking, salting, drying, filleting, freezing, or rendering into meal or oil, but does not mean heading and gutting unless additional preparation is done.

Processor means a person, vessel, or facility that (1) engages in processing, or (2) receives live groundfish directly from a fishing vessel for sale without further processing.

Prohibited species are those species and species groups which must be returned to the sea as soon as is practicable with a minimum of injury when caught and brought aboard except when their retention is authorized by other applicable law. Exception may be made in the implementing regulations for tagged fish, which must be returned to the tagging agency, or for examination by an authorized observer.

Quota means a specified numerical harvest objective, the attainment (or expected attainment) of which causes closure of the fishery for that species or species group. Groundfish species or species groups under this FMP for which quotas have been achieved shall be treated in the same manner as prohibited
Recreational fishing means fishing for sport or pleasure, but not for sale.

Regulatory discards are fish harvested in a fishery which fishermen are required by regulation to discard whenever caught or are required by regulation to retain, but not sell.

Roller (or bobbin) trawl is a bottom trawl that has footropes equipped with rollers or bobbins made of wood, steel, rubber, plastic, or other hard material which keep the footrope above the seabed, thereby protecting the net.

Set net is a stationary, buoyed, and anchored gillnet or trammel net.

Spawning biomass is the biomass of mature female fish at the beginning of the year. If the production of eggs is not proportional to body weight, then this definition should be modified to be proportional to expected egg production.

Spawning biomass per recruit is the expected egg production of a female fish over its lifetime. Alternatively, this is the mature female biomass of an equilibrium stock divided by the mean level of recruitment that produced this stock.

Spear is a sharp, pointed, or barbed instrument on a shaft. Spears may be propelled by hand or by mechanical means.

Stock Assessment and Fishery Evaluation (SAFE) document is a document prepared by the Council that provides a summary of the most recent biological condition of species in the fishery management unit, and the social and economic condition of the recreational and commercial fishing industries, and the fish processing industry. It summarizes, on a periodic basis, the best available information concerning the past, present, and possible future condition of the stocks and fisheries managed by the FMP.

Target fishing means fishing for the primary purpose of catching a particular species or species group (the target species).

A total catch limit is a portion of the OY for a groundfish FMU species, stock, or stock complex assigned to a defined fishery sector or to an individual vessel. Total catch is defined as landed catch plus bycatch (discarded) mortality. The Council may specify total catch limits that are transferable or non-transferable among sectors or tradable or non-tradable between vessels.

Trammel net is a gillnet made with two or more walls joined to a common float line.

Trap (or pot) is a portable, enclosed device with one or more gates or entrances and one or more lines attached to surface floats.

Vertical hook-and-line gear (commercial) is hook-and-line gear that involves a single line anchored at the bottom and buoyed at the surface so as to fish vertically.

[Amended: 5, 11, 13, 17, 18, 19]
4 PREVENTING OVERFISHING AND ACHIEVING OPTIMUM YIELD

4.1 National Standard 1 Guidelines

National Standard 1 requires that "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the U.S. fishing industry" (50 CFR 600.310(a)).

The determination of OY and ACL is a decisional mechanism for resolving the Magnuson-Stevens Act’s multiple purposes and policies, implementing an FMP’s objectives and balancing the various interests that comprise the national welfare. OY is based on MSY, or on MSY as it may be reduced... [in consideration of social, economic or ecological factors]... The most important limitation on the specification of OY and ACL is that the choice of OY and ACL, and the conservation and management measures proposed to achieve it must prevent overfishing (50 CFR Section 600.310(b)).

This chapter addresses the essential considerations suggested for National Standard 1, as identified in the NMFS guidelines on the standard (600.310):

- Estimating MSY, estimated the MSY biomass and setting the MSY control rule (50 CFR 600.310(c); Section 4.2 of this Chapter).
- Specifying stock status determination criteria (maximum fishing mortality threshold and minimum stock size threshold, or reasonable proxies thereof) (50 CFR 600.310(d); Section 4.4 of this Chapter).
- Actions for ending overfishing and rebuilding overfished stocks (including the development and adoption of rebuilding plans) (50 CFR 600.310(c); Section 4.5 of this Chapter).
- Setting OY and apportionment of harvest levels (50 CFR 600.310(f); Section 4.6 of this Chapter).

In establishing OYs and ACLs for West Coast groundfish, this FMP uses the interim step of calculating ABCOFLs and ABCs for major stocks or management units (groups of species). ABCOFL is the MSY harvest level associated with the current stock abundance. Over the long term, if ABCOFLs are fully harvested, the average of the ABCOFLs would be MSY. ABC is a threshold below the OFL, which incorporates a scientific uncertainty buffer in harvest specifications designed to prevent overfishing.

OYs and ACLs are set and apportioned under the procedures outlined in Chapter 5.

4.2 Species Categories

BMSY, ABCOFL, and the overfished/rebuilding stock size threshold cannot be precisely defined for all species, because of the absence of available information for many species managed under the FMP. For the purpose of setting MSY, ABCOFL, the maximum fishing mortality threshold (MFMT), the minimum stock size threshold (MSST), ABC, OY, ACL and rebuilding standards, three categories of species are identified. The first are the relatively few those species for which a relatively data-rich quantitative stock assessment can be conducted on the basis of catch-at-age, catch-at-length or other data. ABCOFLs and overfished/rebuilding thresholds can generally be calculated for these species. ABCs can also be calculated for these species based on the uncertainty of the biomass estimated within an assessment or the variance in biomass estimates between assessments for all species in this category. The second category includes a large number of species for which some biological indicators are available, but including a...
relatively data-poor quantitative assessment or a nonquantitative analysis cannot be conducted. It is difficult to estimate overfished and overfishing thresholds for the second category of species a priori, but indicators of long-term, potential overfishing can be identified. ABCOFIs and ABCs for species in this category are typically set at a constant level and some monitoring is necessary to determine if this level of catch is causing a slow decline in stock abundance. The third category includes minor species which are caught, but for which there is, at best, only information on landed biomass. For species in this category, it is impossible to quantitatively determine MSY, ABCOFI, or an overfished threshold. Typically, average historic catches are used to determine the OFL for category 3 species.

A fourth category of species is identified as ecosystem component (EC) species. These species are not "in the fishery" and therefore not actively managed. EC species are not targeted in any fishery and are not generally retained for sale or personal use. EC species are not determined to be subject to overfishing, approaching an overfished condition, or overfished, nor are they likely to become subject to overfishing or overfished in the absence of conservation and management measures. Harvest specifications are not decided for EC species, although the bycatch of EC species is monitored to ensure they continue to be classified correctly.

4.3. Determination of MSY, or MSY Proxy, and \( B_{MSY} \)

Harvest policies are to be specified according to standard reference points such as MSY (MSY, interpreted as a maximum average achievable catch under prevailing ecological and environmental conditions over a prolonged period). The long-term average biomass associated with fishing at \( F_{MSY} \) is \( B_{MSY} \). In this FMP, MSY generally refers to a constant \( F \) control rule that is assumed to produce the maximum average yield over time while protecting the spawning potential of the stock. Thus the constant \( F \) control rule is generally the proxy for the MSY control rule. Fishing rates above \( F_{MSY} \) eventually result in biomass smaller than \( B_{MSY} \) and produce less harvestable fish on a sustainable basis. The biomass level that produces MSY (i.e., \( B_{MSY} \)) is generally unknown and assumed to be variable over time due to long-term fluctuations in ocean conditions, so that no single value is appropriate. During periods of unfavorable environmental conditions it is important to account for reduced sustainable yield levels.

The problem with an \( F_{MSY} \) control rule is that it is tightly linked to an assumed level of density-dependence in recruitment, and there is insufficient information to determine the level of density-dependence in recruitment for many West Coast groundfish stocks. Therefore, the use of approximations or proxies is necessary. Absent a more accurate determination of \( F_{MSY} \), the Council will apply default MSY proxies. The current (2004-2009) proxies are: \( F_{45\%} \) for flatfish and whiting, \( F_{50\%} \) for rockfish (including thornyheads) and \( F_{45\%} \) for all species such as sablefish and lingcod. However, values (\( F_{40\%} \), \( F_{45\%} \), and \( F_{50\%} \)) are provided here as examples only and are expected to be modified from time to time as scientific knowledge improves. If available information is sufficient, values of \( F_{MSY} \), \( B_{MSY} \), and more appropriate harvest control rules may be developed for any species or species group.

At this time, it is generally believed that, for many species, \( F_{45\%} \) strikes a balance between obtaining a large fraction of the MSY if recruitment is highly insensitive to reductions in spawning biomass and preventing a rapid depletion in stock abundance if recruitment is found to be extremely sensitive to reductions in spawning biomass. The long-term expected yield under an \( F_{45\%} \) policy depends upon the (unknown) level of density-dependence in recruitment. The recommended level of harvest will reduce the average lifetime egg production by each female entering the stock to 45% of the lifetime egg production for females that are unfished.
Because the level of recruitment is expected to decline somewhat as a stock is fished at $F_{49\%}$, the expected $B_{MSY}$ proxy is less than 45% of the unfished biomass. A biomass level of 40% is a reasonable proxy for $B_{MSY}$. The short-term yield under an $F_{49\%}$ policy will vary as the abundance of the exploitable stock varies. This is true for any fishing policy that is based on a constant exploitation rate. The abundance of the stock will vary, because of the effects of fishing, and because of natural variation in recruitment. When stock abundance is high (i.e., near its average unfished level), short-term annual yields can be approximately two to three times greater than the expected long-term average annual yield. For many of the long-lived groundfish species common on the West Coast, this “fishing down” transition can take decades. Many of the declines in APCOFL that occurred during the 1980s were the result of this transition from a lightly exploited, high abundance stock level to a fully exploited, moderately abundant stock level. Further declines below the overfished levels in the 1990s were due in large part to harvest rate policies that were later discovered to not be sustainable. More recent stock assessments indicate that West Coast groundfish stocks likely have lower levels of productivity than other similar species worldwide. Based on this retrospective information, harvest rate policies in the 1990s were too high to maintain stocks at $B_{MSY}$. The Council revised its harvest rate policies for lower levels of production, described below.

Scientific information as of 1997 (Clark 1993; Ianelli and Heifetz 1995; Mace 1994) indicated that $F_{33\%}$ may not be the best approximation of $F_{MSY}$, given more realistic information about recruitment than was initially used by Clark in 1991. In his 1993 publication Clark extended his 1991 results by improving the realism of his simulations and analysis. In particular he (1) modeled stochasticity into the recruitment process, (2) introduced serial correlation into recruitment time series, and (3) performed separate analyses for the Ricker and Beverton-Holt spawner-recruit functions. For rockfish, these changes improved the realism of his spawning biomass per recruit (SPR) harvest policy calculations, because these species are known to have stochastic recruitment and they appear to display serial correlation in recruitments (especially on interdecadal time scales), and because the Beverton-Holt spawner-recruit curve may be biologically the most plausible recruitment model. The effect of each of these changes, in isolation and in aggregate, was to decrease $F_{MSY}$. Consequently, the estimated SPR reduction needed to provide an optimal $F_{MSY}$ proxy (defined as that level of fishing which produces the largest assured proportion of MSY), must necessarily be increased. Clark concluded that $F_{40\%}$ is the optimal rate for fish stocks exhibiting recruitment variability similar to Alaska groundfish stocks. Likewise, Mace (Mace 1994) recommended the use of $F_{40\%}$ as the target mortality rate when the stock-recruitment relationship is unknown. Lastly, Ianelli and Heifetz (Ianelli and Heifetz 1995) determined that $F_{44\%}$ was a good $F_{MSY}$ proxy for Gulf of Alaska Pacific ocean perch, although he subsequently indicated that a recent recruitment to that stock was larger than expected and that $F_{44\%}$ may be too conservative in that case.

Based on this information and advice by its Groundfish Management Team, in 1997 the Council concluded that $F_{40\%}$ should be used as the proxy for $F_{MSY}$ for rockfish in the absence of specific knowledge of recruitment or life history characteristics which would allow a more accurate determination of $F_{MSY}$. This proxy was later revised based on further Scientific and Statistical Committee (SSC) investigation into the appropriate $F_{MSY}$ proxies in 2000.

In the spring of 2000, the Council’s SSC sponsored a workshop to review the Council’s groundfish exploitation rate policy. The workshop explored the historic use of different fishing mortality (F) rates and found that the Council’s past practices have generally changed in response to new information from the scientific community. Starting in the early 1990s, the Council used a standard harvest rate of $F_{35\%}$. The SSC’s workshop participants reported that new scientific studies in 1998 and 1999 had shown that the $F_{35\%}$ and $F_{40\%}$ rates used by the Council had been too aggressive for Pacific Coast groundfish stocks,
such that some groundfish stocks could not maintain a viable population over time. A 1999 study, The Meta-Analysis of the Maximum Reproductive Rate for Fish Populations to Estimate Harvest Policy; a Review (Myers, et al. 2000) showed that Pacific Coast groundfish stocks, particularly rockfish, have very low productivity compared to other, similar species worldwide. One prominent theory about the reason for this low productivity is the large-scale North Pacific climate shifts that are thought to cycle Pacific Coast waters through warm and cool phases of 20-30 years duration. Pacific Coast waters shifted to a warm phase around 1977-1978, with ocean conditions less favorable for Pacific Coast groundfish and other fish stocks. Lower harvest rates are necessary to guard against steep declines in abundance during these periods of low productivity (low recruitment). After an intensive review of historic harvest rates, and current scientific literature on harvest rates and stock productivity, the SSC workshop concluded that $F_{45\%}$ is too aggressive for many Pacific Coast groundfish stocks, particularly for rockfish. For 2001 and beyond, the Council adopted the SSC’s new recommendations for harvest policies of: $F_{40\%}$ for flatfish and whiting, $F_{30\%}$ for rockfish (including thornyheads) and $F_{45\%}$ for other groundfish such as sablefish and lingcod.

In the past, $F_{MSY}$ fishing rates were treated by the Council (as intended) as targets. Under the Magnuson-Stevens Act as amended in 1996, these fishing rates are more appropriately considered to be thresholds that should not be exceeded (see Section 4.4).

The Council will consider any new scientific information relating to calculation of MSY or MSY proxies and may adopt new values based on improved understanding of the population dynamics and harvest of any species or group of species.

While $B_{MSY}$ may be set based on the averaged unfished abundance ($B_{unfished}$) there are many possible approximations and estimates of mean $B_{unfished}$. If the necessary data exist, the following standard methodology is the preferred approach:

$$\text{mean } B_{unfished} = \text{mean } R \times \text{SPR}(F=0)$$

Where mean $R$ is the average estimated recruitment expected under unfished conditions, and SPR($F=0$) is the spawning potential per recruit at zero fishing mortality rate. SPR($F=0$) is normally available as part of the calculation leading to determination of $F_{45\%}$ and is equivalent to $F_{100\%}$.

4.4. Determination of $ABCOFL$ and $ABC$

In establishing OYs and ACLs for West Coast groundfish, this FMP utilizes the interim step of calculating $ABCOFL$s and $ABC$s for major stocks or management units (groups of species). $ABCOFL$ is the MSY harvest level associated with the current stock abundance. Over the long term, if $ABCOFL$s are fully harvested, the average of the $ABCOFL$s would be MSY. $ABC$ is a harvest specification set below the OFL and is a threshold that incorporates a scientific uncertainty buffer against overfishing (i.e., exceeding the OFL). The SSC recommends the OFL and a range of ABCs for each stock and stock complex. The ABC is associated with a probability of overfishing ($P^*$). The Council decides an ABC from the SSC-recommended range based on an overfishing risk assessment informed by the estimated probability of overfishing.
4.4.1. Stocks with **OFL and ABC Set by Relatively Data-Rich Quantitative Assessments, Category 1**

The stocks with relatively data-rich quantitative assessments are those that have recently been assessed by a catch-at-age or catch-at-length analysis and judged to be informative for deciding stock-specific harvest specifications by the SSC. Annual evaluation of the appropriate MSY proxy (e.g., $F_{15+}$) for species in this category will require some specific information in the SAFE document. Estimated age- or length-specific maturity, growth, and availability to the fishery (with evaluation of changes over time in these characteristics) are sufficient to determine the relationship between fishing mortality and yield-per-recruit and spawning biomass-per-recruit. The estimated time series of recruitment, spawning biomass, and fishing mortality are also required to determine whether recent trends indicate a point of concern. In general, $ABC_{OFL}$ will be calculated by applying $F_{15+}$ (or $F_{40+}$, $F_{60+}$, or other established MSY proxy) to the best estimate of current biomass. This current biomass estimate may be for a single year or the average of the present and several future years. Thus, $ABC_{OFL}$ may be intended to remain constant over a period of three or more years.

The ABC, which incorporates a scientific uncertainty buffer against overfishing, can be calculated for category 1 species. The SSC quantifies the variability in biomass estimates for category 1 species from stock assessments as a basis for evaluating the size of a scientific uncertainty buffer (i.e., the difference between the OFL and the ABC) and the risk of overfishing the stock. Approaches to quantifying the variability in biomass estimates include using the standard error about the estimated biomass of a stock in the most recently approved assessment and estimating the between-assessment variance in biomass estimates for a stock with multiple assessments or for all category 1 stocks with multiple assessments in a meta-analysis. A proxy variance ($\sigma$) can be calculated using this latter approach for all or some category 1 species. None of these approaches are mutually exclusive and the SSC may recommend stock-specific approaches to quantifying scientific uncertainty for category 1 species. Once scientific uncertainty is quantified, it is mapped to an estimated probability of overfishing ($P^*$). The Council chooses the ABC from the SSC-recommended range based on the estimated $P^*$. Figure 4-1 shows the relationship between $P^*$ and the appropriate buffer between the OFL and the ABC assuming the estimated biomass variance is 0.50.

![Figure 4-1](image)

**Figure 4-1.** Relationship between the probability of overfishing ($P^*$) and an appropriate buffer between the ABC and the OFL, assuming only that $\sigma = 0.50$. 

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4.4.2. Stocks with ABCOFL and ABC Set by Relatively Data-Poor Quantitative or Nonquantitative Assessment, Category 2

These stocks with ABCOFL set by relatively data-poor quantitative or nonquantitative assessments typically do not have a recent, quantitative assessment, but there may be a previous assessment or some indicators of the status of the stock. Category 2 stocks may also have a recent assessment that was judged to be relatively data-poor by the SSC. Detailed biological information is not routinely available for these stocks, and ABCOFL levels have typically been established on the basis of average historical landings, trends in a fishery independent survey or some other index of current biomass. Typically, the spawning biomass, level of recruitment, or the current fishing mortality rate for Category 2 stocks are unknown. The Council places high priority on improving the information for managing these stocks so that they may be moved to Category 1 status.

Since there is greater scientific uncertainty for category 2 stocks relative to category 1 stocks, the scientific uncertainty buffer is greater than that recommended for category 1 stocks. The SSC recommends the ABC for category 2 stocks. [Should the 25% precautionary reduction be considered as a proxy ABC rule for category 2 stocks?]

4.4.3. Stocks Without ABCOFL Values Set by Nonquantitative Assessment, Category 3

Of the 8990-plus groundfish species managed under the FMP, ABCOFL values have been established for only about 2432. The remaining species are incidentally landed and usually are not listed separately on fish landing receipts. Information from fishery independent surveys are often lacking for these stocks, because of their low abundance or they are not vulnerable to survey sampling gear. Until sufficient quantities of at-sea observer program data are available or surveys of other fish habitats are conducted, it is unlikely that there will be sufficient data to upgrade the assessment capabilities or to evaluate the overfishing potential of these stocks. Interim ABCOFL values may be established for these stocks based on average historic catch or qualitative information, including advice from the Council's advisory entities.

Since there is greater scientific uncertainty for category 3 stocks relative to category 1 or 2 stocks, the scientific uncertainty buffer is greater than that recommended for category 1 and 2 stocks. The SSC recommends the ABC for category 3 stocks. [Should the 50% precautionary reduction be considered as a proxy ABC rule for category 3 stocks?]

4.4.4. Ecosystem Component Stocks Without OFL Values

Ecosystem Component species do not require specification of reference points (i.e., OFLs, ABCs, and ACLs) but are monitored to the extent that any new pertinent scientific information becomes available (e.g., catch trends, vulnerability, etc.) to determine changes in their status or their vulnerability to the fishery. For this classification, such species should:

1) be a non-target species or stock;
2) not be determined to be subject to overfishing, approaching overfished, or overfished;
3) not be likely to become subject to overfishing or overfished, according to the best available information, in the absence of conservation and management measures; and
4) not generally be retained for sale or personal use.

Categorizing FMP species as Ecosystem Component species is done biennially in the specifications...
4.5. Precautionary Thresholds and Overfishing Status Determination Criteria

The National Standard Guidelines define two thresholds that are necessary to maintain a stock at levels capable of producing MSY: the maximum fishing mortality threshold (MFMT) and a minimum stock size threshold (MSST). These two limits are intended for use as benchmarks to decide if a stock or stock complex is being overfished or is in an overfished state. The MFMT and MSST are intrinsically linked through the MSY control rule, which specifies how fishing mortality or catches could vary as a function of stock biomass in order to achieve yields close to MSY.

4.5.1. Determination of Precautionary Thresholds

The precautionary threshold is the biomass level at which point the harvest rate will be reduced to help the stock return to the MSY level (see Section 4.6.1 - Default Precautionary and Interim Rebuilding Calculation). The precautionary biomass threshold is in addition to the overfishing and overfished/rebuilding thresholds required under the Magnuson-Stevens Act (MFMT and MSST). The precautionary biomass threshold is higher than the overfished biomass (MSST). Because $B_{MSY}$ is a long term average, biomass will by definition be below $B_{MSY}$ in some years and above $B_{MSY}$ in other years. Thus, even in the absence of overfishing, biomass may decline to levels below $B_{MSY}$ due to natural fluctuation. By decreasing harvest rates when biomass is below $B_{MSY}$ but maintaining MSY control rule (or proxy control rule) harvest rates for biomass levels above MSY, the precautionary threshold and accompanying response effectively constitute a control rule that manages for harvests lower than MSY and an average biomass above MSY.

The precautionary threshold is established only for category 1 species. The precautionary threshold will be the $B_{MSY}$ level, if known. The default precautionary threshold will be 40% of the estimated unfished biomass level. The Council may recommend different precautionary thresholds for any species or species group based on the best scientific information about that species or group. It is expected the threshold will be between 25% and 50% of the estimated unfished biomass level.

4.5.2. Determination of Overfishing Threshold

In this FMP, for Category 1 species, the term "overfishing" is used to denote situations where catch exceeds or is expected to exceed the established AFCOFL, or MSY proxy ($F_{MSY}$). This can also be expressed as where catch exceeds or is expected to exceed the MFMT. The term "overfished" describes a stock whose abundance is below its overfished/rebuilding threshold, or MSST. Overfished/rebuilding thresholds, in general, are linked to the same productivity assumptions that determine the AFCOFL levels. The default value of this threshold is 25% of the estimated unfished biomass level or 50% of $B_{MSY}$, if known. The MFMT is simply the value(s) of fishing mortality in the MSY control rule. Technically, exceeding $F_{MSY}$ constitutes overfishing.
4.7. Determination of OY, ACL, and ACT

Optimum yield (OY) is defined in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) as the amount of fish which will provide the greatest overall benefit to the Nation. The Magnuson-Stevens Act also specifies that OY is based on maximum sustainable yield (MSY), and may be equal to or less than MSY. The fishery management plan (FMP) authorizes establishment of a numerical or non-numerical OY for any groundfish species or species group and lays out the procedures the Council will follow in determining appropriate numerical OY values. An OY may be specified for the fishery management area as a whole or for specific subareas. Numerical one-year OYs will be specified biennially, based on acceptable biological catch-overfishing limits (ABCOFLs) for major species or species groups, which are in turn based on quantitative or qualitative stock assessments. Control rules for determining the numerical values of OYs ensure they will not exceed the ABCOFLs except under tightly limited conditions.

The OY is a target level of annual harvest and can be exceeded annually as long as it is not exceeded on average over the long term. The OY differs from an annual catch limit (ACL) in that the ACL is a total catch limit which cannot be exceeded annually. All sources of fishing-related mortality, including landings, discard mortality, research catches, and catches under exempted fishing permit activities, count against the ACL. The ACL and the OY are directly analogous to how these specifications have been used in West Coast groundfish management since 1999 when the Council began specifying total catch OYs. [NOTE: a national working group will be convened by NMFS to develop guidelines for the specification and use of OYs in light of the introduction of the ACL in new NSI guidelines. Until that guidance is provided, it may be prudent to set OYs equal to ACLs. Regardless, the FMP under Amendment 23 will generally use the term ACL instead of OY to describe annual catch limits.]

If ACLs are exceeded more often than 1 in 4 years, then accountability measures (AMs), such as catch monitoring and inseason adjustments to fisheries, need to improve. Otherwise, an annual catch target (ACT), which is a level of harvest below the ACL, may need to be specified. The ACT, which is yet another AM, may be especially important for a stock subject to highly uncertain inseason catch monitoring. Unlike an ACL, the ACT can be exceeded annually. However, it is expected that inseason adjustments to fisheries will occur upon attainment of an ACT. OYs, ACLs, and ACTs, if needed, are annual specifications that are specified every other year in the biennial specifications process described in section 5.1.

ACLs and ACTs can also be specified for sectors of a fishery. In such cases, the sector-specific ACLs and/or ACTs would sum to the ACL or ACT specified for the stock. Sector-specific ACLs may be decided for sectors with a formal, long-term allocation of the harvestable surplus of a stock (see section 6.3). A sector-specific ACT may serve as a harvest guideline for a sector or used strategically in a rebuilding plan to attempt to reduce mortality of an overfished stock more than the rebuilding plan limits prescribe.

Most of the species managed by the FMP have never been assessed in either a quantitative or qualitative manner. In some cases even basic catch statistics are unavailable, because many species (rockfish, for example) are not sorted unless specifically required by regulation. Species of this type have generally not been subject to numerical harvest limits, but rather harvest is limited by gear restrictions and market demand. Other management measures which determine the total amount of harvest each year include trip landing and frequency limits. Those species without a specified OY, ACL, and not included in a multi-species OY, ACL will be included in a non-numerical OY, which is defined as all the fish that can be taken under the regulations, specifications, and management measures authorized by the FMP and promulgated by the U.S. Secretary of Commerce. This non-numerical OY is not a predetermined
numerical value, but rather the harvest that results from regulations, specifications, and management measures as they are changed in response to changes in the resource and the fishery. In many cases, the absence of a numerical specification reflects the absence of basic management information, such as abundance estimates and catch statistics. The non-numerical OY concept allows for a variable amount of groundfish to be harvested annually, limited by such constraints as gear restrictions, management measures for other species, and/or absence of consumer acceptance or demand.

The close spatial relationship of many groundfish species throughout the management area results in commercial and recreational catches often consisting of mixtures of several species. This is especially the case in the trawl fishery where fishermen may target on one species, but unavoidably harvest several other species. In such cases, the optimum harvest strategy often is to target on a group (complex or assemblage) of groundfish species.

The Council will avoid allowing overfishing individual stocks and control harvest mortality to allow overfished stocks to rebuild to the MSY level. In the event the Council determines that greater long-term benefits will be gained from the groundfish fishery by overfishing individual stocks or by preventing a stock from recovering to its MSY level, it will justify the action in writing in accordance with the procedures and standards identified in this section and the National Standard Guidelines (50 CFR 600.310(d)). Conversely, the Council may determine that greater benefits will accrue from protecting an individual stock by constraining the multiple species complex or specific components of that complex.

Prior to implementation of the FMP in 1982, the states of Washington, Oregon, and California managed the groundfish fishery without the use of quotas. State regulations since the mid-1940s took the form of area closures (such as San Francisco Bay), legal gear definitions, minimum codend mesh regulations, size limits, bag limits, and other non-quota management measures. Implementation of the FMP built upon those historical management practices by increasing the level of catch monitoring, improving the assessment of stock conditions, and establishing other mechanisms for responding to management needs. It provides for continuation of the historical fishery on traditionally harvested groundfish species while allowing for the development of new fisheries for underutilized species. The FMP, as amended, provides for the establishment of resource conservation measures such as harvest guidelines or quotas through the annual specification procedure and annual and inseason management measures through the Apoints of concern@ and socioeconomic framework mechanisms.

Reduction in catches or fishing rates for either precautionary or rebuilding purposes is an important component of converting values of $ABCOFL$ to values of $OYACL$. This relationship is specified by the harvest control rule. All $OYACL$ will remain in effect until revised, and, whether revised or not, will be announced at the beginning of the fishing period along with other specifications (see Chapter 5).

Groundfish stock assessments generally provide the following information to aid in determination of $ABCOFL$ and $OYACL$.

1. Current biomass (and reproductive potential) estimate.
2. $F_{MSY}$ or proxy, translated into exploitation rate.
3. Estimate of MSY biomass ($B_{MSY}$), or proxy, unfished biomass (based on average recruitment), precautionary threshold, and/or overfished/rebuilding threshold.
4. Precision estimate (e.g., confidence interval) for current biomass estimate.
4.7.1. Determination of Numerical $O\times ACL_{s}$ If Stock Assessment Information Is Available from a Relatively Data-Rich Assessment (Category 1)

The Council will follow these steps in determining numerical $O\times ACL_{s}$. The recommended numerical $O\times ACL_{s}$ values will include any necessary adjustments to harvest mortality needed to rebuild any stock determined to be below its overfished/rebuilding threshold and may include adjustments to address uncertainty in the status of the stock.

1. $ABCOFL$: Multiply the current fishable biomass estimate times the $F_{MSY}$ exploitation rate or its proxy to get $ABCOFL$.

2. Precautionary adjustment: If the abundance is above the specified precautionary threshold, $O\times ACL_{s}$ may be equal to or less than $ABCOFL$. If current biomass estimate is less than the precautionary threshold (Section 4.5.14.4.4), the harvest rate will be reduced according to the harvest control rule specified in Section 4.6.14.5.4 in order to accelerate a return of abundance to optimal levels. If the abundance falls below the overfished/rebuilding threshold (Section 4.5.34.4.2), the harvest control rule will generally specify a greater reduction in exploitation as an interim management response toward rebuilding the stock while a formal rebuilding plan is being developed. The rebuilding plan will include a specific harvest control rule designed to rebuild the stock, and that control rule will be used in this stage of the determination of $O\times ACL_{s}$.

3. Uncertainty adjustments: In cases where there is a high degree of uncertainty about the biomass estimate and other parameters, $O\times ACL_{s}$ may be further reduced accordingly.

4. Other adjustments to $O\times ACL_{s}$: Adjustments to $O\times ACL_{s}$ for other social, economic, or ecological considerations may be made. $O\times ACL_{s}$ will be reduced for anticipated bycatch mortality (i.e., mortality of discarded fish). Amounts of fish harvested as compensation for private vessels participating in NMFS resource survey activities will also be deducted from $ABCOFL$ prior to setting $O\times ACL_{s}$.

5. $O\times ACL_{s}$ recommendations will be consistent with established rebuilding plans and achievement of their goals and objectives.
   (a) In cases where overfishing is occurring, Council action will be sufficient to end overfishing.
   (b) In cases where a stock or stock complex is overfished, Council action will specify $O\times ACL_{s}$ in a manner that complies with rebuilding plans developed in accordance with Section 4.6.24.5.2.
   (c) For fisheries managed under an international agreement, Council action must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States.
   (d) For any stock that has been declared overfished, the open access/limited entry allocation shares may be temporarily revised for the duration of the rebuilding period by amendment to the regulations in accordance with the normal allocation process described in this FMP. However, the Council may at any time recommend the shares specified in chapter 12 of this FMP be reinstated without requiring further analysis. Once reinstated, any change may be made only through the allocation process.
   (e) For any stock that has been declared overfished, any vessel with a limited entry permit may be prohibited from operating in the open access fishery when the limited entry
fishery has been closed.

6. Adjustments to $\Omega_{ACL}$ could include increasing $\Omega_{ACL}$ above the default value up to the overfishing level $ABC$ as long as the management still allows achievement of established rebuilding goals and objectives. In limited circumstances, these adjustments could include increasing $\Omega_{ACL}$ above the overfishing level as long as the harvest meets the standards of the mixed stock exception in the National Standard Guidelines:

(a) The Council demonstrates by analysis that such action will result in long-term net benefits to the Nation.

(b) The Council demonstrates by analysis that mitigating measures have been considered and that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristic in a manner such that no overfishing would occur.

(c) The resulting rate or level of fishing mortality will not cause any species or evolutionarily significant unit thereof to require protection under the Endangered Species Act.

7. For species complexes (such as Sebastes complex), the $\Omega_{ACL}$ will generally be set equal to the sum of the individual component $ABC_{OFL}$s, HGs, and/or $\Omega_{ACL}$s, as appropriate.

4.7.2. Determination of a Numerical $\Omega_{ACL}$ If $ABC_{OFL}$ Is Based on a Relatively Data-Poor Quantitative or Non-quantitative Assessment (Category 2)

1. $ABC_{OFL}$ may be based on average of past landings, a previous relatively data-poor assessment, a non-quantitative assessment, or other qualitative information.

2. Precautionary adjustments, if any, would be based on relevant information. In general, the Council will follow a risk-averse approach and may recommend an $\Omega_{ACL}$ below $ABC_{OFL}$ if there is a perception the stock is below its MSY biomass level. If a declining trend persists for more than three years, then a focused evaluation of the status of the stock, its $ABC_{OFL}$, and the overfishing parameters will be quantified. If data are available, such an evaluation should be conducted at approximately five-year intervals even when negative trends are not apparent. In fact, many stocks are in need of re-evaluation to establish a baseline for monitoring of future trends. Whenever an evaluation indicates the stock may be declining and approaching an overfished state, then the Council should:

(a) Recommend improved data collection for this species.

(b) Determine the rebuilding rate that would increase the multispecies value of the fishery.

3. Uncertainty adjustment: In cases where there is a high degree of uncertainty about the condition of the stock or stocks, $\Omega_{ACL}$ may be reduced accordingly.

4. Amounts of fish harvested as compensation for industry research activities will also be deducted.

5. These adjustments could include increasing $\Omega_{ACL}$ above the default value as indicated for Category 1 stocks, items 5 and 6 above.

4.7.3. Non-numerical $\Omega_{ACL}$ for Stocks with No $ABC_{OFL}$ Values Set by Non-quantitative Assessment (Category 3)

Fish of these species are incidentally landed and usually are not listed separately in fish landing receipts.
Information from fishery-independent surveys are often lacking for these stocks, because of their low abundance or they are not vulnerable to survey sampling gear. Until sufficient quantities of at-sea observer program data are available or surveys of other fish habitats are conducted and/or requirements that landings of all species be recorded separately, it is unlikely that there will be sufficient data to upgrade the assessment capabilities or to evaluate the overfishing potential of these stocks.

These species typically may be included in a non-numerical OY that is defined as all the fish that can be taken under the regulations, specifications, and management measures authorized by the FMP and promulgated by the Secretary. Such an OY may not be a predetermined numerical value, but rather that harvest that results from regulations, specifications, and management measures as they are changed in response to changes in the resource and the fishery. Nothing in this FMP prevents inclusion of these species in a numerical OY if the Council believes that is more appropriate. have OFL values based on average historical landings, often from a species composition estimate of landings from port sampling, and a precautionary reduction of the ABC and ACL of half the OFL amount.

[Amended: 11, 16-1, 17, 23]