

National Marine Fisheries Service
**DESCRIPTION OF METHODOLOGY
FOR DETERMINING
OVERFISHING AND OVERFISHED STATUS**

The report provides an overview of status determinations made for stocks subject to overfishing, overfished, rebuilt, or approaching an overfished condition. Information related to necessary management actions to be taken and progress being made in rebuilding overfished stocks is provided in the supporting tables.

Overfishing determinations (the current fishing mortality rate or level of annual catch compared to an identified threshold) and overfished determinations (the current biomass compared to an identified threshold) - or their proxies- are presented separately in the supporting tables. Overfishing and overfished determinations should not be added together, as this would result in double counting for some stocks. Summaries should always be made of numbers of overfished stocks and numbers of stocks subject to overfishing, but not a combined status of the stocks. The categories not overfished and approaching an overfished condition are mutually exclusive. Any stock listed as approaching an overfished condition (estimated to become overfished within 2 years) is not included in the not overfished category, even though it is currently not overfished, to eliminate double counting. Overfishing and overfished status determination criteria are updated annually and posted on the NOAA Office of Sustainable Fisheries web site concurrently with the annual release of the Status of U.S. Fisheries Report to Congress.

The Fish Stock Sustainability Index

While generally not specifically discussed in the Annual Report to Congress on the Status of U.S. Fisheries, NMFS developed the FSSI to track the outcome of building and maintaining fish stocks and complexes at productive levels and to incorporate the critical components of managing fish harvest rates and increasing knowledge about the status of fish stocks and complexes. This metric is discussed here to add context to NMFS tracking of stock performance. The FSSI is based on a set of fish stocks and complexes selected for their importance to commercial and recreational fisheries. Stocks and complexes were selected for the FSSI using various criteria, including (1) the stock is a major stock (with landings greater than 200,000 pounds), (2) the stock was either overfished or subject to overfishing, (3) the stock was scheduled to be assessed within the next 5 years, and (4) the stock had been identified previously as important.¹ The FSSI tracks 227² stocks and complexes.

¹ *Some stocks identified in previous reports as “major” were excluded from the FSSI for one or more of the following: (1) they are managed under the Endangered Species Act; (2) they are managed on the basis of escapement rates, not biomass targets; (3) the overfishing and/or overfished status are unknown and are not likely to become known in the next 5 years; (4) determinations were made using pre-SFA status determination criteria and they are not likely to be reassessed in the next 5 years; (5) they are managed by state fisheries managers; or (6) no status determination criteria exist to assess the overfishing or overfished status nor will they likely exist in the next 5 years. Most of the minor stocks were not included in the FSSI because these species co-occur with other stocks but are not landed in large quantities, and they are not important to the targeted fishery.*

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The FSSI is calculated by assigning a score for each fish stock or complex based on the following rules:

Rule	Score
1. Stock has <i>known</i> status determinations	
a) <i>overfishing</i> status known	0.5
b) <i>overfished</i> status known	0.5
2. Fishing mortality rate is below the <i>overfishing</i> level defined for the stock (i.e., is not subject to overfishing)	1.0
3. Biomass is above the <i>overfished</i> level defined for the stock (i.e., is not overfished)	1.0
4. Biomass is at or above 80% of maximum sustainable yield (B_{MSY}) ³ (this point is in addition to the point awarded for being above the <i>overfished</i> level).	1.0
<i>Total possible score:</i>	<i>4</i>

The total score for each stock is obtained by adding the score from each rule, and the FSSI is computed by summing the individual stock scores. The maximum score a stock may have is 4, and the maximum value for the index is 920 ($230^2 \times 4$). The information used to generate the FSSI score comes from the status determinations made in this report (i.e., overfishing/no overfishing, overfished/not overfished), as well as more detailed information on biomass levels (i.e., B relative to B_{MSY}). The biomass information is used to determine when stocks are managed at sustainable levels (for the purpose of FSSI, a stock with biomass at least 80 percent of B_{MSY} is considered “sustainably managed”), except for stocks that are rebuilding which must first achieve a biomass that is at least 100 percent of B_{MSY} .

The FSSI measures the outputs of NMFS’ efforts in several ways. First, it captures increased knowledge of our stocks. When assessments are conducted on stocks with a previously unknown status, the change to a known from an unknown determination ensures that management actions are based on a better scientific understanding of the stocks. Second, it reflects the management goals of maintaining the fishing mortality within target levels. Third, although more indirectly, the FSSI captures information about increasing abundance of the stocks, reflected in biomass levels. Restricting fishing effort (F) should result in increasing biomass levels. Over time, the increasing stock should (1) no longer be overfished, and (2) reach its target biomass level. Thus, both positive outputs and outcomes are reflected in the score of a stock.

² Two stocks were removed from federal management (stone crabs and little tunny) and two stocks are now consolidated into one (South Atlantic black grouper and Gulf of Mexico black grouper are now a combined South Atlantic/Gulf of Mexico black grouper). As a result, the official number of FSSI stocks under federal management has been reduced from 230 to 227. Until fiscal year 2015, the scores of these stocks will still be counted and the maximum number of points is based on 230 stocks.

³ A stock rebuilding from a previously overfished condition is not awarded the fourth point until it reaches B_{MSY} -- the largest potential long-term average catch or yield that can be taken from a core stock or stock assemblage under prevailing conditions -- as mandated by the Magnuson-Stevens Act. After a stock has been fully rebuilt, it may fluctuate within the 80% parameter and retain the score of 4 like the other non-rebuilding stocks.

Determining Status of Stocks

Section 303 (a)(10) of the Act requires that FMPs specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished. Further, under Section Sec. 304(e)(1)) of the Act, the overfishing criteria specified in the FMP is used to determine the stock status. NS1 guidelines clarify that status determination criteria (SDC) shall specify both a maximum fishing mortality threshold (MFMT) and a minimum stock size threshold (MSST), or reasonable proxies. MFMT means the level of fishing mortality (F), on an annual basis, above which overfishing is occurring. MSST means the level of biomass below which the stock or stock complex is considered to be overfished. If the current fishing mortality rate (F) is above the MFMT, then overfishing is occurring. If the stock size is below the MSST, then the stock is overfished.

A stock or stock complex is approaching an overfished condition when it is projected that there is more than a 50 percent chance that the biomass of the stock or stock complex will decline below the MSST within two years. The definition for the biomass threshold in the FMP, along with trends in fishing effort, is usually the basis for determining whether a stock is approaching an overfished condition.

Stock assessments or Stock Assessment and Fishery Evaluation (SAFE) Reports typically provide information on fishing mortality and biomass estimates, and should be used as the basis for making status determinations for overfishing, overfished, and approaching an overfished condition. Some stocks use catch relative to its overfishing limit (OFL) as the basis for making an overfishing status determination for annual reporting purposes. For stocks that are rebuilding, the rebuilt status should be reported when that is achieved. All four of these determinations should be made concurrent with the stock assessment or SAFE Report, whenever possible.

Year-to-year Comparisons

Prior to 2000, if stocks were either subject to overfishing or overfished, they were listed in the Status of Fisheries report as overfished. For this reason, results of reports prior to 2000 are not generally comparable with results from 2000 onward. In addition, there have been some changes to the number of stocks subject to overfishing and overfished, based solely as a result of listing at the stock or complex level. These factors should be carefully considered when making year-to-year comparisons.

Rebuilding Program Progress

The supporting tables provide information about rebuilding plans for overfished stocks. For stocks that already have rebuilding plans in place, the progress of each rebuilding plan is indicated in the table, giving information about the number of years the program has been in place and the current target number of years for the rebuilding plan. For purposes of this report, December 31, is used as the cutoff date for determining the current year of the rebuilding plan. Some plans do not have a target time to rebuild

because they lack the data necessary for rebuilding projections.

Any stock that has previously been listed, or is currently listed, as overfished is required to have a rebuilding program until the stock has been rebuilt to levels consistent with supporting MSY on a sustainable basis. During rebuilding, a stock will increase in abundance so that it is no longer overfished, but the rebuilding program continues until the stock is fully rebuilt. This status is indicated in the “Overfished?” column of the table by the entry *not overfished – rebuilding*.

The “Management Action Required” column denotes stocks for which rebuilding plans are being developed, and stocks currently in rebuilding programs, as follows:

- *rebuilding program* - indicates a stock that has recently been determined overfished and that does not yet have a rebuilding plan. These stocks are footnoted to indicate when the Council was notified of the overfished status, and the Council has two years from that date to implement a rebuilding plan.
- *continue rebuilding* - indicates a stock that is in a rebuilding program.

In some cases, a domestic rebuilding plan under the MSA is not required. This would include stocks managed under an international agreement that are overfished due to excessive international fishing pressure and for which there are no management measures to end overfishing. In addition, recovery of severely overfished stocks may be pursued through requirements under the Endangered Species Act (ESA), rather than under the MSA.

Stocks listed as overfished in this report may have experienced excessive levels of fishing effort in past years, and appropriate measures have been taken to reduce fishing mortality on these stocks. Other stocks may be listed as *overfished* because of prevailing environmental conditions, habitat degradation, or natural fluctuations in the stocks. These factors may have reduced the stock biomass to levels below that necessary to produce MSY on a continuing basis. Sometimes, management measures have little impact on the status of the stocks. For example, some of the highly migratory species stocks are significantly impacted in fisheries outside the Council’s jurisdiction in international waters. Other stocks, such as Pacific salmon, are listed as threatened or endangered under the ESA, and management for these stocks is conducted under the ESA. Fishing effort has been appropriately reduced or eliminated, but the stocks remain overfished due to factors beyond the Council’s control. Although the Councils, NMFS, and any management regime will make every effort to implement appropriate management measures, rebuilding programs may not necessarily restore some stocks to a healthy level, until these other factors are effectively handled.

METHODOLOGY FOR STATUS DETERMINATIONS

Basis for Determining Status of Overfishing

Section 304 (e)(1) of the MSA specifies that, for those stocks in a FMP or international agreement, the status shall be determined using the criteria specified in the FMP or agreement. Many stocks have defined SDC that have been used to determine stock status. Other stocks have defined SDC, but have never been assessed relative to these SDC or the assessment failed to provide a conclusive determination about stock status. Still others may have no SDC (neither a benchmark nor numerical estimate of the biological reference points), but are not classified as ecosystem component species. The status of these stocks will be listed as *unknown*, but still counted when reporting the number of stocks / stock complexes in the FMP because all stocks in the management unit must be accounted for.

Determinations for Stocks, Assemblages, or Complexes that do not use Approved SDC Contained in the FMP but use Best Scientific Information Available

Guidelines to comply with National Standard 2 indicate that FMPs – including criteria for determining stock status - must take into account the best scientific information available (BSIA). Many FMPs adopt and implement revisions to SDC or revised estimates of numerical reference points coincident with new assessments so that the SDC in the plans is the BSIA. For those plans that do not automatically adopt new SDC coincident with a new stock assessment deemed the BSIA, stock status listed in the Report will be based on the BSIA. This policy ensures that stock status is always based on the most recent information. The plan should be amended as soon as possible to adopt the new reference points determined to be the BSIA. Until this is done, the official status will be based on BSIA and footnoted to indicate status relative to SDC in the FMP.

Reporting Level – Stocks and Stock Complexes

The status of all stocks managed under an FMP implemented under the MSA, or under an international agreement, for which there are criteria, will be reported in the annual Status of U.S. Fisheries Report to Congress. Stock status will also be updated quarterly on the NOAA Office of Sustainable Fisheries web site. The status of all managed species contained in an FMP will be reported at the level for which the SDC are specified in the FMP. For stocks that do not have measurable SDC, there is no basis for reporting stock status.

A single species in an FMP may have multiple stocks, and each stock may be reported separately. Multiple species may be grouped into stock complexes, and the status of the stock complex is reported as a single unit. In each case, the reporting unit is determined by the SDC within the stock's FMP. For some stock complexes, an individual stock is assessed and serves as the proxy stock for all stocks within the stock complex. Although it is the proxy stock that is assessed, the SDC apply to the stock complex, so that is the unit for which stock status is reported. Wherever stock complexes are reported, the names of all individual stocks within that complex are provided as a footnote to the listing table.

Determinations based on Stock Assessments that Result in Known Determinations but Fail to Provide Management Advice

In rare cases, a stock assessment may provide a conclusion about stock status, but falls short of providing adequate information for management advice to fisheries managers. This could include, but not be limited to, failure to provide target fishing levels or rebuilding projections. For example, a stock assessment report may conclude that it is highly likely a stock is overfished, but lacks the data necessary to provide a rebuilding target. As long as the results from the assessment were accepted, the status determinations must still be reported as the official stock status. This procedure does not apply to cases where the stock assessment is rejected, but only to cases where the results of the assessment have been accepted, which may include assessments with a high level of uncertainty.

Determinations based on Stock Assessments that Result in Unknown Determinations

Sometimes, a stock assessment is rejected because the data were insufficient and it fails to provide a known conclusion about the overfishing and/or overfished status. The conclusion of an unknown determination from a stock assessment must be reported by the Region; statements about uncertainty can often confuse what the final conclusion was, so the status determination must be clearly articulated.

For purposes of reporting stock status to the public, where a known determination had previously been provided and a new assessment is either rejected or is accepted, but the results are inconclusive, the known stock status will continue to be the official stock status. The most recent assessment that concluded unknown status will be communicated to the public in a footnote. Measures to end overfishing for stocks that were previously found to be subject to overfishing and rebuild overfished stocks for stocks found to be overfished must continue even if the most recent assessment could not determine stock status. The only exception is if an assessment is later determined to be invalid. Invalidating a stock assessment is a formal process that must be executed in order to void the results.

Determinations based on Stock Assessments that are later Invalidated

In rare cases, it may be found that an error was made in a previous stock assessment that would have resulted in a different stock status *at that time*. For example, if it is determined that the wrong data were used, a miscalculation occurred, or the basis for the determination was never valid to begin with, this would serve as the basis for invalidating a stock assessment.

Knowledge of fish stocks and the procedures used to assess them are constantly changing and evolving. As long as the basis for the determination was valid, there were no errors in calculations or methodology, and the best available science at the time was used, the

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results of previous stock assessments will not be invalidated even if the new assessment revises what is now known about past stock status.

Formally invalidating a stock assessment requires a Decision Memorandum (DM) cosigned from both the Regional Science Center and Regional Office to the NMFS Office of Sustainable Fisheries (Headquarters or HQ), providing a detailed explanation of why the stock assessment is not valid, including what errors were made in the earlier assessment. The DM will also recommend what change in status is recommended as a result of invalidating the assessment. HQ will review the DM and determine if the basis for invalidating the assessment is valid and whether to concur with the recommended status change. If signed by the AA, this Decision Memo will serve as the basis for revising the stock status and this change will be communicated in the quarterly stock status updates.

A stock assessment cannot be later invalidated simply because updated information results in a different conclusion about past stock status. What scientists and managers know about fish stocks is constantly evolving and there will always be changes to what is defined as the best scientific information. As long as the best available information was used at the time and the basis was valid, however rudimentary it may have been, the determination that was reported will remain the official stock status for that assessment.

Status Determinations based on Citable Evaluation Documents

Rarely, a stock status determination is made where a formal (i.e., peer reviewed) assessment is lacking, but may be appropriate in very limited cases. For example, a stock in which the fishery is closed can reasonably be expected to be not subject to overfishing, provided that no extenuating circumstances exist (i.e., bycatch in other fisheries, state water fishery). In such cases, a determination will be made on the basis of a Citable Evaluation Document (CED). A CED is typically used as the basis for an overfishing determination, but in rare cases, can be used as the basis for an overfished determination.

The Science Center should produce the CED and the Region will review and submit the document to HQ. A CED must be updated and submitted annually for each stock whose status is based on this type of analysis. Guidance to Determine and Document Stock Status and Rebuilding Plan Progress provides basic elements that should be discussed and analyzed in a CED.

Overfished Status Determinations using Time Series Data

Section 304(e)(2) of the MSA states the following:

If the Secretary determines at any time that a fishery is overfished, the Secretary shall immediately notify the appropriate Council and request that action be taken to end overfishing in the fishery and to implement conservation and management measures to rebuild affected stocks of fish.

Overfished determinations are typically made by using the last year for which data are available (hereafter referred to as the “terminal year”); however data from a non-terminal year can provide useful information about past stock status. Most stock assessments include previous years’ estimates of stock size, referred to as a time series. Sometimes the time series from the new assessment provides a different conclusion about stock status in a non-terminal year compared to stock status in the terminal year.

Whenever a time series is used to update stock status and revise management actions, all of the years in the time series may be considered, but only as far back as the last assessment. Thus, the time series cannot be used to formally change status determinations *that have already been made* in an earlier year, using a different assessment as the basis. The only exception to reversing a status determination is if the assessment for which the determination is based is invalidated. Setting a time limit as far back as the last assessment ensures that an indefinite time series cannot be used to revise stock status or change management requirements.

The following is the only type of change where a non-terminal year can be used to update stock status or trigger a change in management action, but only using the time series *as far back as the last assessment*:

- Rebuilding stock meets rebuilding target in a non-terminal year, but is below rebuilding target / not overfished in the terminal year. In this example, the stock will be considered rebuilt.

Revising SDC

Status determination criteria are likely to be revised over time, as scientists refine their estimates of biological reference points. The SDC may be revised in terms of the benchmark used to assess the stock, such as using spawning stock biomass in lieu of total spawning biomass, or total catch instead of direct fishing mortality estimates. In addition, numerical estimates of the biological reference points (BRPs), such as F_{MSY} , B_{MSY} , or related proxies, may also be re-estimated, resulting in different threshold levels for determining stock status.

The FMP directs how the SDC will be updated. For example, some FMPs allow both the benchmarks and numerical estimates of BRPs to be revised concurrent with the acceptance of a stock assessment or SAFE Report. Other FMPs require an FMP amendment to revise the benchmarks only, but allow numerical estimates of BRPs to be updated concurrent with an assessment. Although no standard exists for the time between assessments, a full benchmark assessment (in which SDC may be revised) is generally conducted every 2-6 years, although some stocks may not be reassessed for 10 years or more. An agency performance measure, Percentage of Living Marine Resources (LMRs) with Adequate Population Assessments and Forecasts, was developed to: (1) produce new adequate assessments for species and stocks that do not currently have one; and, (2) maintain the adequacy of existing assessments by periodically refreshing them with new data and analyses. For fish stocks, an assessment is deemed adequate if it meets

or exceeds the Stock Assessment Improvement Plan (SAIP) level 3 data standards and has been done or updated within the past 5 years. This performance measure only includes the stocks contained in the Fish Stock Sustainability Index (FSSI).

Stock Status Determination Process

Section 304 (e)(2) of the Act states if the Secretary determines at any time that a fishery is overfished, the Secretary shall immediately notify the appropriate Council and request that action be taken to end overfishing in the fishery and to implement conservation and management measures to rebuild affected stocks of fish. Within NMFS, the task of making the determinations of overfishing and overfished has been delegated to the Assistant Administrator (AA) for Fisheries. Once a stock assessment or other accepted basis is peer reviewed and accepted as BSIA, the Region submits a draft Decision Memo (DM) to HQ. After the draft DM has been reviewed and a final draft approved by HQ, a final DM signed by the Regional Administrator (RA) is submitted, requesting that the AA concur with the status indicated in the DM. Informing the Councils of stocks subject to overfishing or overfished stocks is the duty of the RA and will be communicated by a formal letter notifying them of such status.

Revising and Reclassifying Stock Units in FMPs

Stock units are constantly changing, sometimes as a result of new stock assessments, other times due to changes in the management units. New assessments may result in consolidation or splitting of species into separate stocks when there is a scientific basis for doing so. To comply with requirements to implement annual catch limits (ACLs) for all stocks, some Councils revised the unit for reporting, using catch compared to the overfishing level (OFL) as the basis for determining overfishing status. In some cases, this decision was based on the ability to more effectively track catch, and to use catch/OFL as a proxy in the absence of a stock assessment. This has resulted in changes to the number of stocks/stock complexes reported in the management unit from year-to-year, with considerable changes occurring in the years following ACL implementation. Such changes are likely to be less frequent now that all FMPs are in compliance with requirements for ACLs, but some changes can be expected from year-to-year as new stocks are assessed and Councils continue to refine the management units.

ACL amendments also led some Councils to adjust the number of stocks contained in the management unit of their FMPs. These changes were done to more accurately account for stocks within a fishery compared to those that are not. The MSA gives Councils considerable discretion in defining a “fishery” in their FMPs. Some FMPs include one or a few stocks, whereas others include hundreds of species in an effort to incorporate ecosystem approaches to management. NMFS considers all stocks in an FMP to be “in the fishery” unless a stock has been specifically identified through an FMP or FMP amendment as an “ecosystem component species.” Ecosystem component (EC) species are non-target stocks that are not subject to overfishing or overfished (or likely to become so), and generally not retained for sale or personal use. EC species are not in the management unit and are not required to have ACLs. Data collection only complexes are

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currently treated as de facto EC species and do not have ACLs specified. The net effect of these adjustments is to better comply with the intent of the MSA to apply ACLs to stocks for which there is targeted or non-targeted catch.