APPENDIX 1. REPORT FORMAT AND DESCRIPTION OF METHODOLOGY FOR DETERMINING OVERFISHING AND OVERFISHED STATUS

The general format of this report remains the same as previous reports. The printed copy of the report provides an overview of status determinations made for stocks subject to overfishing, overfished, 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 compared to an identified threshold) and overfished determinations (the current biomass compared to an identified threshold) in the supporting tables are presented separately. 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 definitions are provided in Appendix 2.

Fish Stock Sustainability Index

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. 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 will track 230 stocks and complexes over a 5-year period.

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

[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.*

Rule	**Score**
1. Stock has *known* status determinations	
a) *overfishing* status known	0.5
b) *overfished* status known	0.5
2. Fishing mortality rate is below the *overfishing* level defined for the stock (i.e., is not subject to overfishing)	1.0
3. Biomass is above the *overfished* 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})[2] (this point is in addition to the point awarded for being above the *overfished level.*	1.0
Total possible score:	*4*

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 x 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.

Determining Status of Stocks

If the current fishing mortality rate (F) is above the maximum fishing mortality threshold (MFMT), then overfishing is occurring. If the stock size is below the minimum stock size threshold (MSST), then the stock is overfished. As noted above, overfishing and overfished categories are separate determinations and should not be added together

[2] *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.*

because this may result in double counting for the stocks that have status determinations under both criteria.

In addition, if a stock size is expected to fall below the MSST within 2 years, then it is listed as approaching an overfished condition. Determinations are based on the criterion in the FMP or other official document for the overfished (biomass or B) component and trends in various indicators relative to that criterion. For some stocks, pre-SFA definitions, including proxy Maximum Sustainable Yield (MSY) and MSST, were used as a basis in determining whether a stock was approaching an overfished condition.

For salmon stocks contained in the West Coast Salmon FMP, determining whether a stock is approaching a condition of being overfished is based on a different, albeit analogous, set of criteria. A conservation alert is triggered during the annual preseason process if a natural stock or stock complex is projected to fall short of its conservation objective (MSY, MSY proxy, Maximum Sustainable Production ($MSP_{2)}$, or floor, in the case of some harvest rate objectives) for 1 year. The criteria used by the PFMC is more conservative than recommended under the National Standard Guidelines, and a 1-year departure from the MSY/MSP_2 spawner objectives does not necessarily mean the stock will be unable to produce MSY in the long term.

Status determinations may be based either on fully approved status determination criteria (SDC) – specifying both a MFMT and a MSST – or on partially approved or fully disapproved definitions. If a partially approved definition exists in the FMP, the determinations were made using the approved portion of the definition and the disapproved portion would result in a listing of *undefined*. If neither overfishing nor overfished definitions are contained in the FMP, the stock will be listed as *undefined* in both categories.

Year-to-year Comparisons

Because the SDC used to assess stocks contained in this report have changed over the years, it is difficult to make year-to-year comparisons of stocks. Removal of the third column (*overfished*) used in reports prior to 2000 also makes direct comparisons difficult. Nevertheless, the determinations in the fishing mortality rate column in previous years' reports can be compared to the determinations in the overfishing column this year. Likewise, the determinations in previous years' biomass column can be compared to the overfished column in this year's report. The FSSI, an established set of stocks for reporting, will make year-to-year comparisons easier.

Rebuilding Progress

Information is provided in the supporting tables on those stocks for which rebuilding programs are required. By identifying the type of management action required when overfishing is occurring or when a stock is overfished, it is possible to correctly note which stocks require reduction of the fishing mortality rate and which stocks actually

require rebuilding plans. The progress of each rebuilding plan is indicated in the last column of the table, giving information about the number of years the program has been in place and the total number of years the program is expected to exist. Some plans were approved prior to the SFA amendments and are footnoted accordingly, and those for which there is no defined time line are also noted. For purposes of this report, December 2007 is used as the cutoff date for determining in what year the rebuilding plan is.

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. Overfished stocks that do not have a rebuilding program are listed as *rebuilding program* in the Management Action Required column, which indicates that a rebuilding program is required for this stock. Overfished stocks that are listed as *continue rebuilding* in the Management Action Required column are currently rebuilding under an approved rebuilding program. Stocks listed as *not overfished - rebuilding* were previously below the MSST, are now above that level, but have not been rebuilt to the target levels specified in their rebuilding plans. These stocks are currently rebuilding under an approved rebuilding plan, and are listed as *continue rebuilding* in the Management Action Required column. It is important to note that the status of rebuilding stocks should not be considered as healthy until they have been fully rebuilt. Stocks listed as *to be developed* are stocks that have recently been declared overfished. These stocks are footnoted to indicate when the Council was notified of their overfished status, and the Council has one year from that date to submit a rebuilding plan.

Many of the stocks listed as overfished in this report have experienced excessive levels of fishing effort in recent 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, many of the Pacific salmon stocks under the PFMC jurisdiction are not significantly impacted in fisheries within the Council's jurisdiction. Other stocks 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

As required by section 304(e)(1) of the MSA, the status determination for those stocks managed under an FMP or international agreement was based on the SDC (i.e., the overfishing definition) specified in the FMP or agreement, whenever possible (see Appendices 2 through 5). Prior to requirements under the SFA, most existing overfishing

definitions were based wholly or in part on either a fishing mortality rate (F) or stock biomass (B), but not both. The SFA requires SDC to specify both a MFMT or reasonable proxy thereof, and a MSST or reasonable proxy thereof. Thus, stocks must be assessed according to whether the MFMT is being exceeded and whether the stock is below the MSST. National Standard 1 guidelines (600.310 (d)(1)) specify that overfishing and overfished criteria should relate to the stock's ability to produce MSY. Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes that capacity of a stock or stock complex to produce MSY on a continuing basis. An overfished stock or stock complex is one whose size is sufficiently small that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding.

In conformance with SFA requirements, this report identifies the status determination of stocks based on both the fishing mortality rate and stock biomass, wherever possible. The National Standard Guidelines require NMFS to determine whether the MFMT is being exceeded or the biomass is below the established MSST for each stock. If either overfishing is occurring or a stock is being overfished, management action is required. For stocks in which overfishing is occurring, fishing mortality must be reduced so stocks can produce MSY on a continuing basis; for overfished stocks, rebuilding plans must be implemented so stocks can be rebuilt to the level necessary to produce MSY on a continuing basis. The following is a description of the basis for status determinations under a variety of scenarios associated with fully approved, partially approved, or fully disapproved definitions.

Information regarding the status of stocks is continually evolving, and additional information has become available for some stocks. For those stocks for which there is updated information in a citable form, that information was used to determine the status of that stock in this report. It is recognized this approach does not include all "preliminary" information for each stock. However, this approach has been taken to minimize potential confusion as conclusions about stock conditions change with changes in "preliminary" information.

<u>Fully Approved Definitions under the SFA</u>: For those stocks contained in FMPs for which overfishing definitions were fully approved, status determinations were based on assessments using both the fishing mortality rate and biomass definitions, wherever possible. If the fishing mortality rate exceeded the established fishing mortality rate threshold, the stock was listed as *overfishing* occurring. If the biomass was below the established biomass threshold, the stock was listed as *overfished*. Stocks listed as *unknown* are those for which there is an approved overfishing definition, but for which no determination can be made because of insufficient information.

<u>Partially Approved Definitions under the SFA</u>: For stocks contained in FMPs for which SDC were only partially approved (i.e., only one of the two necessary criteria was approved), status determinations were based on the approved criteria. For these stocks, determinations were made using the approved criterion, and the other component was listed as *undefined*. Stocks listed as undefined are those for which there is no status

criterion by which to make a determination.

Definitions under the SFA That Are Fully Disapproved or Still under Review: For those stocks contained in FMPs for which the overfishing definitions were fully disapproved or are still under review, status determinations cannot be made. When status criteria are not available, the stock is listed as *undefined*.

Stocks Contained in Federal FMPs for Which Definitions Do Not Apply: Some stocks contained in federal FMPs have never had an overfishing or overfished definition. Such stocks are usually minor and are contained in federal FMPs in which overfishing definitions exist, but the definitions do not apply to these stocks. The status of such stocks is listed as *undefined*.

Stocks Not Contained in Federal FMPs, Stocks Contained in Federal FMPs under Development, and Stocks Contained in Non-Federal FMPs Managed by Interstate Fishery Management Commissions for Which There Are No Definitions: For these cases, if overfishing definitions are available for either component, they will be used to make the status determinations. If definitions are not available the stock will be listed as *undefined*. If there is no basis for making a determination, the stock is listed as *unknown*.

APPENDIX 2. ACRONYMS USED IN THE TEXT AND APPENDICES

$\forall$ - The relative stock size at which the overfishing level falls to zero, set at a default value of 0.05 with the understanding that the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information.

ABC - Allowable Biological Catch - A term that refers to the range of allowable catch for a species or species group. It is set each year by a scientific group. The ABC estimates are used to set the annual total allowable catch (TAC). This term is also referred to as Acceptable Biological Catch.

ASMFC - Atlantic States Marine Fisheries Commission - Serves as a deliberative body of the Atlantic coastal states, coordinating the conservation and management of nearshore fishery resources, including marine, shell, and anadromous species.

B - The weight (biomass) of a group of fish.

B_{MSY} - The weight (biomass) of a group of fish necessary to produce MSY on a continuing basis.

CFMC - Caribbean Fishery Management Council.

CPUE - Catch Per Unit of Effort - The number of fish caught by an amount of effort. Typically, effort is a combination of gear type, gear size, and length of time gear is used. Catch per unit of effort is often used as a measurement of relative abundance.

EEZ - Exclusive Economic Zone - All waters from the seaward boundary of coastal states out to 200 nautical miles.

EPR – Eggs Per Recruit - The average number of eggs produced by an individual fish that has been recruited, i.e., that moved into a certain class, such as the spawning class or fishing-size class. Used as an index of abundance.

ESA - Endangered Species Act.

F - Fishing Mortality Rate - A measurement of the rate of removal of fish from a population by fishing. Fishing mortality rate can be reported as either discrete or instantaneous. Discrete mortality is the percentage of fish dying in one year. Instantaneous mortality is the rate at which fish are dying at a point in time.

F_{ABC} - The level of fishing mortality that results in the allowable biological catch.

F_{MAX} - The level of fishing mortality that results in the greatest yield from the fishery.

F_{MSY} - The level of fishing mortality that results in the maximum sustainable yield.

F_{OF} - The level of fishing mortality defined as overfishing.

F_{OFL} - The level of fishing mortality associated with overfishing.

$F_{20\%}$ - The level of fishing mortality that results in a spawning potential ratio of 20% of the maximum.

$F_{25\%}$ - The level of fishing mortality that results in a spawning potential ratio of 25% of the maximum.

$F_{30\%}$ - The level of fishing mortality that results in a spawning potential ratio of 30% of the maximum.

$F_{35\%}$ - The level of fishing mortality that results in a spawning potential ratio of 30% of the maximum.

$F_{40\%}$ - The level of fishing mortality that results in a spawning potential ratio of 40% of the maximum.

$F_{0.1}$ - The point on the spawning per recruit curve at which the level of spawning per recruit is 35% of 40% of the maximum.

FAKR - NMFS, Alaska Region.

FMP - Fishery Management Plan - A plan to achieve specified management goals for a fishery.

FSSI – Fish Stock Sustainability Index.

GARM - Groundfish Assessment Review Meeting. A review of stock status for groundfish stocks under the Northeast Multispecies Fishery Management Plan.

GMFMC - Gulf of Mexico Fishery Management Council.

GSMFC - Gulf States Marine Fisheries Commission - Serves as a deliberative body for the Gulf of Mexico coastal states, coordinating the conservation and management of nearshore fishery resources, including marine, shell, and anadromous species.

HMS - Highly migratory species including tunas, marlins, oceanic sharks, sailfishes, and swordfish; the HMS Management Division develops fishery policies designed to manage any Atlantic highly migratory species.

LTPY - Long-Term Potential Yield - The maximum long-term average catch that can be achieved from a resource.

MAFMC - Mid-Atlantic Fishery Management Council.

MFMT – Maximum Fishing Mortality Threshold – The level or rate of fishing mortality, that if exceeded, constitutes overfishing because it jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis.

MSA – Magnuson-Stevens Fishery Conservation and Management Act.

MSRA – Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006.

MSP_1 - Maximum Spawning Potential - See SPR.

MSP_2 - Maximum Sustainable Production - The adult spawning population that will, on average, maximize the biomass of juvenile outmigrants with average environmental conditions. Conservation objectives for specific salmon stocks managed under the Pacific Coast Salmon Plan are currently based on either MSP principles for stocks managed primarily for natural production or on hatchery escapement needs for stocks managed for artificial production.

MSST – Minimum Stock Size Threshold – The minimum size of the stock or stock complex that is required to produce MSY, the size below which the stock or stock complex is determined to be overfished. The threshold should equal whichever of the following is greater: ½ the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock were exploited at the maximum fishing mortality threshold.

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.

NEFMC - New England Fishery Management Council.

NEFSC - NMFS, Northeast Fisheries Science Center.

NPFMC - North Pacific Fishery Management Council.

OLO - *Our Living Oceans* - A report on the status of U.S. living marine resources.

OY - Optimum Yield - The amount of fish that: (1) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (2) is prescribed on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factors; (3) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.

pdf - Probability Density Function - A description of the probability that a variable takes

a specified value.

PFMC - Pacific Fishery Management Council.

SAFE - Stock Assessment and Fishery Evaluation - A document or set of documents that provides Councils with 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 interests and the fish processing industries. It summarizes, on a periodic basis, the best available scientific information concerning the past, present, and possible future condition of the stocks and fisheries being managed under federal regulation.

SAFMC - South Atlantic Fishery Management Council.

Salmon FMP - Pacific Coast Salmon Plan.

SARC - Stock Assessment Review Committee.

SEDAR - Southeast Data, Assessment and Review.

SEFSC - Southeast Fishery Science Center.

SFA - Sustainable Fisheries Act - Amended the Magnuson-Stevens Fishery Conservation and Management Act, on October 11, 1996.

SPR - Spawning Potential Ratio - The number of eggs that could be produced by an average recruit in a fished stock, divided by the number of eggs that could be produced by an average recruit in an unfished stock. SPR can also be expressed as the spawning stock biomass per recruit (SSBR) of a fished stock divided by the SSBR of the stock before it was fished.

SSB - Spawning Stock Biomass - The total weight of the fish in a stock that are old enough to spawn.

SSBR - Spawning Stock Biomass Per Recruit - The spawning stock biomass divided by the number of recruits to the stock, or how much spawning biomass an average recruit would be expected to produce.

SSC - Scientific and Statistical Advisory Committee - A group of scientific and technical people giving advice to a Council.

TAC – Total Allowable Catch.

T coho - The average coho life span that would be expected over the long term in the absence of exploitation. The default of T coho is 4 years, but the SSC may set T coho at a different value without an FMP amendment on the basis of the best scientific

information.

TRAC - Transboundary Resources Assessment Committee - A committee established in 1998 to peer review assessments of transboundary resources in the Georges Bank area and thus to ensure that the management efforts of both Canada and the United States, pursued either independently or cooperatively, are founded on a common understanding of resource status.

WPFMC - Western Pacific Fishery Management Council.