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GUIDELINES FOR PREPARING STOCK ASSESSMENT REPORTS PURSUANT TO THE 1994 AMENDMENTS TO THE MMPA

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SUMMARY OF REVISIONS:
Revised based largely upon recommendations of the 2011 GAMMS III workshop. See section 5 for an overview of revisions.

Signed ___/s/_________________2/19/2015_______________
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Guidelines for Preparing Stock Assessment Reports Pursuant to Section 117 of the Marine Mammal Protection Act

1. General Guidelines

Introduction

Section 117 of the Marine Mammal Protection Act (MMPA) requires that the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) develop Stock Assessment Reports (Reports) for all marine mammal stocks in waters under U.S. jurisdiction (U.S. waters). These Reports are to be based upon the best scientific information available. Reports are not required for stocks that have a remote likelihood of occurring regularly in U.S. waters (e.g., stocks for which only the margins of the range extend into U.S. waters or that enter U.S. waters only during anomalous current or temperature shifts).

The MMPA requires Reports to include, among other things, information on how stocks were identified, a calculation of Potential Biological Removal (PBR), and an assessment of whether incidental fishery takes are "insignificant and approaching zero mortality and serious injury rate," as well as other information relevant to assessing stocks. These reports are to be reviewed annually for "strategic stocks" and stocks for which significant new information is available, and at least once every three years for all other stocks. This document provides guidance for how these topics are to be addressed in the Reports.

The MMPA provides some general guidance for developing the Reports. More detailed guidelines were developed at a PBR workshop in June 1994 and were used in writing the original draft Reports. The draft guidelines and initial draft Reports were subjected to public review and comment in August 1994. Final guidelines and Reports were completed in 1995 (Barlow et al. 1995). In 1996, representatives of NMFS, FWS, regional Scientific Review Groups, and the Marine Mammal Commission reviewed the guidelines and proposed minor changes, which after public review and comment, were made final in 1997 (Wade and Angliss 1997). The guidelines were officially updated again in 2005, following a similar revision process beginning with workshop in September 2003 (NMFS 2005). In February 2011, NMFS again convened representatives of the review groups and agencies to review and, as appropriate, recommend revisions to the guidelines. Those recommended revisions (Moore and Merrick 2011) were made available for public review and comment, and are finalized here.

It is anticipated that the guidelines themselves will be reviewed and changed based on additional scientific research and on experience gained in their application. In this regard, FWS and NMFS will meet periodically to review and revise, as needed, the guidelines. When the agencies recommend revisions to the guidelines, these revisions will be made available for public review and comment prior to acceptance. Furthermore, the guidelines in this document do not have to be followed rigidly; however, any departure from these guidelines must be discussed fully within any affected Report.

The intent of these guidelines is to: (1) provide a uniform framework for the consistent application of the amended MMPA throughout the country; (2) ensure that PBR is calculated in a manner that ensures meeting the goals of the MMPA; (3) provide guidelines for evaluating whether fishery takes are insignificant and approaching a zero mortality and serious injury rate; and (4) make the Federal government's approach clear and open to the public. Where the guidelines provided here are not incorporated into a particular Report, justification for the departure will be provided within the Report. Similarly, the Reports will explain when deviations are made from specific recommendations from the Scientific Review Groups.

The FWS and NMFS interpret the primary intent of the 1994 MMPA amendments and the PBR guidelines developed pursuant to the Act as a mechanism to respond to the uncertainty associated with assessing and reducing marine mammal mortality from incidental fisheries takes. Accordingly, this mechanism is increasingly conservative under increasing degrees of uncertainty. The MMPA requires the calculation of PBR for all stocks, including those that are considered endangered or threatened under the Endangered Species Act (ESA) and those that are managed under other authorities, such as the International Whaling Commission. However, in some cases allowable takes under these other authorities may be less than the PBR calculated under the MMPA owing to the different degrees of "risk" associated with, and the treatment of, uncertainty under each authority. Where there is inconsistency between the MMPA and ESA regarding the take of listed marine mammals, the more restrictive mortality requirement takes precedence. Nonetheless, PBR must still be calculated for these stocks, where possible, and discussed in the text of the Reports. As directed in the MMPA, the PBR is calculated as "...the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population." Therefore, a PBR is an upper limit to removals that does not imply that the entire amount should be taken.

Section 117 requires PBR, human-caused mortality, and classification as to whether a stock is "strategic" or "non-strategic" to be included in the Reports for all stocks of marine mammals in U.S. waters. However, it should be noted that the co-management, between the Federal government and Alaska Native Organizations, of removals of marine mammals for subsistence purposes between the Federal government and Alaska Native organizations is specifically addressed in Section 119. In response to Section 119, NMFS and FWS have entered into cooperative agreements with Alaska Native Organizations to conserve marine mammals and provide co-management of subsistence use by Alaska Natives. FWS and NMFS believe that it is appropriate to develop management programs for stocks subject to subsistence harvests through the co-management process provided that commercial fisheries takes are not significant and that the process includes a sound research and management program to identify and address uncertainties concerning the status of these stocks. Calculations of PBR and classification as to whether a stock is strategic will be determined from the analysis of scientific and other relevant information discussed during the co-management process.

In the sections of the Reports on Stock Definition and Geographic Range, elements of the PBR formula, Population Trend, and Annual Human-caused Mortality and Serious Injury, authors are to provide a brief description of key uncertainties in each element and evaluate the effects of these uncertainties associated with parameters in these sections. In cases where more lengthy discussions of uncertainty are necessary, they should be published separately (e.g., as NOAA Technical Memorandum) and referenced in the SAR.

Definition of "Stock"

"Population stock" is the fundamental unit of legally-mandated conservation. The MMPA defines population stock as "a group of marine mammals of the same species or smaller taxa in a common spatial arrangement, that interbreed when mature." To fully interpret this definition, it is necessary to consider the objectives of the MMPA. Section 2 (Findings and Declaration of Policy) of the MMPA states that "...species and population stocks of marine mammals...should not be permitted to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part, and, consistent with this major objective, they should not be permitted to diminish below their optimum sustainable population." Further, it states "...the primary objective of their management should be to maintain the health and stability of the marine ecosystem. Whenever consistent with this primary objective, it should be the goal to obtain an optimum sustainable population keeping in mind the carrying capacity of the habitat." Therefore, stocks must be identified in a manner that is consistent with these goals. For the purposes of management under the MMPA, a stock is recognized as being a management unit that identifies a demographically independent biological population. It is recognized that in practice, our ability to detect stocks may fall short of this ideal because of a lack of information, or for other reasons.

Many types of information can be used to identify stocks of a species (e.g., distribution and movements, population trends, morphology, life history, genetics, acoustic call types, contaminants and natural isotopes, parasites, and oceanographic habitat). Different population responses (e.g., different trends in abundance) between geographic regions are also an indicator of stock structure, as populations with different trends are not strongly linked demographically. When different types of evidence are available to identify stock structure, the Report must discuss inferences made from the different types of evidence and how these inferences were integrated to identify the stock.

Evidence of morphological or genetic differences in animals from different geographic regions indicates that these populations are demographically independent. Demographic independence means that the population dynamics of the affected group is more a consequence of births and deaths within the group (internal dynamics) rather than immigration or emigration (external dynamics). Thus, the exchange of individuals between population stocks is not great enough to prevent the depletion of one of the populations as a result of increased mortality or lower birth rates.

Failure to detect genetic or morphological differences, however, does not necessarily mean that populations are not demographically independent. Dispersal rates, though sufficiently high to homogenize morphological or genetic differences detectable between putative populations, may still be insufficient to deliver enough recruits from an unexploited population (source) to an adjacent exploited population (sink) so that the latter remains a functioning element of its ecosystem. Insufficient dispersal between populations where one bears the brunt of exploitation coupled with their inappropriate pooling for management could easily result in failure to meet MMPA objectives. For example, it is common to have human-caused mortality restricted to a portion of a species' range. Such concentrated mortality (if of a large magnitude) could lead to population fragmentation, a reduction in range, or even the loss of undetected populations, and would only be mitigated by high immigration rates from adjacent areas.

Therefore, careful consideration needs to be given to how stocks are identified. In particular, where mortality is greater than a PBR calculated from the abundance just within the oceanographic region where the human-caused mortality occurs, serious consideration should be given to identifying an appropriate management unit in this region. In the absence of adequate information on stock structure and fisheries mortality, a species' range within an ocean should be divided into stocks that represent defensible management units. Examples of such management units include distinct oceanographic regions, semi-isolated habitat areas, and areas of higher density of the species that are separated by relatively lower density areas. Such areas have often been found to represent true biological stocks where sufficient information is available. In cases where there are large geographic areas from which data on stock structure of marine mammals are lacking, stock structure from other parts of the species' range may be used to draw inferences as to the likely geographic size of stocks. There is no intent to identify stocks that are clearly too small to represent demographically independent biological populations, but it is noted that for some species genetic and other biological information has confirmed the likely existence of stocks of relatively small spatial scale, such as within Puget Sound, WA, the Gulf of Maine, or Cook Inlet, AK.

Each Report will state in the Stock Definition and Geographic Range section whether it is plausible the stock contains multiple demographically independent populations that should be separate stocks, along with a brief rationale. If additional structure is plausible and human-caused mortality or serious injury is concentrated within a portion of the range of the stock, the Report should identify the portion of the range in which the mortality or serious injury occurs. In addition, a description of any additional key uncertainties concerning the stock definition should be provided, along with an evaluation of the potential effects of these uncertainties on the stock definition.

In transboundary situations where a stock's range spans international boundaries or the boundary of the U.S. Exclusive Economic Zone (EEZ), the best approach is to establish an international management agreement for the species and to evaluate all sources of human-caused mortality and serious injury (U.S. and non-U.S.) relative to the PBR for the entire stock range. In the interim, if a transboundary stock is migratory and it is reasonable to do so, the fraction of time the stock spends in U.S. waters should be noted, and the PBR for U.S. fisheries should be apportioned from the total PBR based on this fraction. For non-migratory transboundary stocks (e.g., stocks with broad pelagic distributions that extend into international waters), if there are estimates of mortality and serious injury from U.S. and other sources throughout the stock's range, then PBR calculations should be based upon a range-wide abundance estimate for the stock whenever possible. In general, abundance or density estimates from one area should not be extrapolated to unsurveyed areas to estimate range-wide abundance (and PBR). But, informed interpolation (e.g., based on habitat associations) may be used to fill gaps in survey coverage and estimate abundance and PBR over broader areas as appropriate and supported by existing data.[1] If estimates of mortality or abundance from outside the U.S. EEZ cannot be determined, PBR calculations should be based on abundance within the EEZ and compared to mortality within the EEZ.

Prospective Stocks

When information becomes available that appears to justify a different stock structure or stock boundaries, it may be desirable to include the new structure or boundaries as "prospective stocks" within the existing Report. The descriptions of prospective stocks would include a description of the evidence for the new stocks, calculations of the prospective PBR for each new stock, and estimates of human-caused mortality and serious injury, by source. The notice of availability of draft Reports with prospective stocks would include a request for public comment and additional scientific information specifically addressing the prospective stock structure. Prospective stocks would be expected to become separate stocks in a timely manner unless additional evidence was produced to contradict the prospective stock structure. Summary information for prospective stocks should be included in the standard table in the Reports that summarizes the minimum population estimate, the maximum net productivity rate, etc. for each stock.

PBR Elements

The 1994 amendments to the MMPA mandate that, as part of the Reports, PBR must be calculated for each marine mammal stock in U.S. waters. The PBR is defined as "the maximum number of animals, not including natural mortality, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population." In addition, the MMPA states that PBR is calculated as the product of three elements: the minimum population estimate (N_{min}); half the maximum net productivity rate ($0.5\ R_{max}$); and a recovery factor (F_r). The guidelines for defining and applying each of these three elements are described below. Further specific guidance on the calculation of PBR is provided in part 2 (Technical Details) of this document. The Report should provide a description of any key uncertainties in the elements of the PBR equation and evaluate the effects of these uncertainties on the estimate.

An underlying assumption in the application of the PBR equation is that marine mammal stocks exhibit certain population dynamics. Specifically, it is assumed that a depleted stock will naturally grow toward OSP and that some surplus growth may be removed while still allowing recovery. There are unusual situations, however, where the formula Congress added to the MMPA to calculate PBR ($N_{min}*0.5R_{max}*F_r$) results in a number that is not consistent with the narrative definition of PBR (the maximum number of animals, not including natural mortality, that may be removed from a marine mammal stock while allowing that stock to reach or maintain

[1] "Informed interpolation" specifically refers to the use of a model-based method for interpolating density between transect lines, such as habitat-based density modeling and other forms of spatial modeling.

its OSP). That is, there are situations where a stock is below its OSP and is declining or stable, yet human-caused mortality is a not a major factor in the population's trend. Thus, for unknown reasons, the stock's population dynamics do not conform to the underlying model for calculating PBR. In such unusual situations, the PBR calculations should be qualified in the Report in the PBR section.

Minimum Population Estimate (N_{min})

N_{min} is defined in the MMPA amendments as an estimate of the number of animals in a stock that:

> "(A) is based on the best available scientific information on abundance, incorporating the precision and variability associated with such information; and,
>
> "(B) provides reasonable assurance that the stock size is equal to or greater than the estimate."

Consistent with these MMPA definitions, N_{min} should be calculated such that a stock of unknown status would achieve and be maintained within OSP with 95% probability. Population simulations have demonstrated (Wade 1994) that this goal can be achieved by defining N_{min} as the 20th percentile of a log-normal distribution based on an estimate of the number of animals in a stock (which is equivalent to the lower limit of a 60% 2-tailed confidence interval):

$$N_{min} = N/\exp(0.842 * (\ln(1+CV(N)^2))^{½})$$

where N is the abundance estimate and CV(N) is the coefficient of variation of the abundance estimate. If abundance estimates are believed to be biased, appropriate correction factors should be applied to obtain unbiased estimates of N. In such cases, the coefficient of variation for N should include uncertainty in the estimation of the correction factor. In cases where a direct count is available, such as for many pinniped stocks, this direct count could alternatively be used as the estimate of N_{min}. Other approaches could also be used to estimate N_{min} if they provide the same level of assurance that the stock size is equal to or greater than that estimate.

Clearly, the most recent abundance estimate becomes a less accurate population descriptor with time. When abundance estimates become many years old, at some point estimates will no longer meet the requirement that they provide reasonable assurance that the stock size is presently greater than or equal to that estimate. Therefore, unless compelling evidence indicates that a stock has not declined since the last census, the N_{min} estimate of the stock should be considered unknown if 8 years have transpired since the last abundance survey. Eight years was chosen, in part, because a population that declines at 10% per year from carrying capacity would be reduced to less than 50% of its original abundance after 8 years. A 10% decline per year over at least 8 years represents the greatest decline observed for a stock of marine mammals in U.S. waters. If N_{min} is unknown, then PBR cannot be determined, but this is not equivalent to considering PBR equal to zero. If there is known or suspected human-caused mortality of the stock, decisions about whether such stocks should be declared strategic or not should be made on a case-by-case basis. Stocks for which N_{min} becomes unknown should not move from "strategic" to "not-strategic", or v.v., solely because of an inability to estimate N_{min}.

Population Trend

The Reports will describe information on current population trend. The Report should also provide a description of any key uncertainties concerning the population trend, and evaluate the effects of these uncertainties on the trend.

Maximum Rate of Increase (R_{max})

One-half R_{max} is defined in the MMPA as "one-half of the maximum theoretical or estimated "net productivity rate of the stock at a small population size," where the term "net productivity rate" means "the annual per capita rate of increase in a stock resulting from additions due to reproduction, less losses due to natural mortality." Default values should be used for R_{max} in the absence of stock-specific measured values. To be consistent with a risk-averse approach, these default values should be near the lower range of measured or theoretical values (or 0.12 for pinnipeds and sea otters and 0.04 for cetaceans and manatees). Substitution of other values for these defaults should be made with caution, and only when reliable stock-specific information is available on R_{max} (e.g., estimates published in peer-reviewed articles or accepted by review groups such as the MMPA Scientific Review Groups or the Scientific Committee of the International Whaling Commission).

Details on rounding and precision, and on averaging more than one estimate of abundance to calculate N_{min}, can be found in part 2 (Technical Details) of this document.

Recovery Factor (F_r)

The MMPA defines the recovery factor, F_r, as being between 0.1 and 1.0. The intent of Congress in adding F_r to the definition of PBR was to ensure the recovery of populations to their OSP levels, and to ensure that the time necessary for populations listed as endangered, threatened, and/or depleted to recover was not significantly increased. The use of F_r less than 1.0 allocates a proportion of expected net production towards population growth and compensates for uncertainties that might prevent population recovery, such as biases in the estimation of N_{min} and R_{max} or errors in the determination of stock structure. Population simulation studies (Barlow et al. 1995, Wade 1998) demonstrate that the default F_r for stocks of endangered species should be 0.1, and that the default F_r for depleted and/or threatened stocks and stocks of unknown status should be 0.5.

The default status should be considered as "unknown." Stocks known to be within OSP (e.g., as determined from quantitative methods such as dynamic response or back-calculation), or stocks of unknown status that are known to be increasing, or stocks that are not known to be decreasing taken primarily by aboriginal subsistence hunters, could have higher F_r values, up to and including 1.0, provided there have not been recent increases in the levels of takes. Recovery factors for ESA-listed stocks can be changed from their default values, but only after careful consideration and where available scientific evidence confirms that the stock is not in imminent danger of extinction. Values other than the defaults for any stock should usually not be used without the approval of the regional Scientific Review Group, and scientific justification for the change should be provided in the Report.

The recovery factor can be adjusted to accommodate additional information and to allow for management discretion as appropriate and consistent with the goals of the MMPA. For example, if human-caused mortalities include more than 50% females, the recovery factor should be decreased to compensate for the greater impact of this mortality on the population (or increased if less than 50% female). Similarly, declining stocks, especially ones that are threatened or depleted, should be given lower recovery factors, the value of which should depend on the magnitude and duration of the decline. The recovery factor of 0.5 for threatened or depleted stocks or stocks of unknown status was determined based on the assumption that the coefficient of variation of the mortality estimate is equal to or less than 0.3. If the CV is greater than 0.3, the recovery factor should be decreased to: 0.48 for CVs of 0.3 to 0.6; 0.45 for CVs of 0.6 to 0.8; and 0.40 for CVs greater than 0.8.

Recovery factors could also be increased in some cases. If mortality estimates are known to be relatively unbiased because of high observer coverage, then it may be appropriate to increase the recovery factor to reflect the greater certainty in the estimates. Thus, in an instance where the observer coverage was 100% and the observed fishery was responsible for virtually all fishery mortality on a particular stock, the recovery factor for a stock of unknown status might be increased from 0.5 (reflecting less concern about bias in mortality, but continued concern about biases in other PBR parameters and errors in determining stock structure). Recovery factors of 1.0 for stocks of unknown status should be reserved for cases where there is assurance that N_{min}, R_{max}, and the estimates of mortality and serious injury are unbiased and where the stock structure is unequivocal.

Annual Human-caused Mortality and Serious Injury

A summary of all human-caused mortality and serious injury should be provided in each Report as the first paragraph under "Annual human-caused mortality and serious injury." This summary should include information on all mortality and serious injury (e.g., U.S. commercial fishing, other fishery mortality from recreational gear and foreign fleets, strandings, vessel strikes, power plant entrainment, shooting, scientific research, after-action reports from otherwise authorized activities, etc.).

The Reports should contain a complete description of what is known about current human-caused mortality and serious injury. Information about incidental fisheries mortality should be provided, including sources such as observer programs, logbooks, fishermen's reports, strandings, and other sources, where appropriate. It is expected that this section of the Reports will include all pertinent information that is subsequently used to categorize fisheries under Section 118. Therefore, any additional information that is anticipated to be used to categorize a fishery should be provided here.

If mortality and serious injury estimates are available for more than one year, a decision will have to be made about how many years of data should be used to estimate annual mortality. There is an obvious trade-off between using the most relevant information (the most recent data) versus using more information (pooling across a number of years) to increase precision and reduce small-sample bias. It is inappropriate to state specific guidance directing which years of data should be used, because the case-specific choice depends upon the quality and quantity of data. Accordingly, mortality estimates could be averaged over as many years as necessary to achieve statistically unbiased estimation with a CV of less than or equal to 0.3. Generally, estimates include the most recent five years for which data have been analyzed, as this accounts for inter-annual variability. However, information more than five years old can be used if it is the most appropriate information available in a particular case.

In some cases it may not be appropriate to average over as many as five years even if the CV of an estimate is greater than 0.3. For example, if within the last five years the fishery has changed (e.g., fishing effort or the mortality rate per unit of fishing effort has changed), it would be more appropriate to use only the most recent relevant data to most accurately reflect the current level of annual mortality. When mortality is averaged over years, an un-weighted average should be used, because true mortality rates vary from year-to-year. When data are insufficient to overcome small-sample bias of mortality estimates for purposes of comparing the estimates to PBR (see Technical Details), a statement acknowledging this elevated potential for small-sample bias should accompany mortality estimates in the Reports.

In some cases, mortality and serious injury occur in areas where more than one stock of marine mammals occurs. When biological information (e.g., photo-identification, genetics, morphology) is sufficient to identify the stock from which a dead or seriously injured animal came, then the mortality or serious injury should be associated only with that stock. When one or more deaths or serious injuries cannot be assigned directly to a stock, then those deaths or serious injuries may be partitioned among stocks within the appropriate geographic area, provided there is sufficient information to support such partitioning (e.g., based on the relative abundances of stocks within the area). When the mortality and serious injury estimate is partitioned among overlapping stocks, the Reports will contain a discussion of the potential for over- or under-estimating stock-specific mortality and serious injury. In cases where mortality and serious injuries cannot be assigned directly to a stock and available information is not sufficient to support partitioning those deaths and serious injuries among stocks, the total unassigned mortality and serious injuries should be assigned to each stock within the appropriate geographic area. When deaths and serious injuries are assigned to each overlapping stock in this manner, the Reports will contain a discussion of the potential for over-estimating stock-specific mortality and serious injury.

A summary of mortality and serious injury incidental to U.S. commercial fisheries should be presented in a table, providing the name of the fishery and, for each appropriate year, observed mortality and serious injury, estimated extrapolated mortality and serious injury and associated CV, and percent observer coverage in that year, with the last column providing the average annual mortality and serious injury estimate for that fishery. Information on non-serious injuries should also be provided, either in the table or the text.[2] Because U.S. commercial fisheries and foreign fisheries within the U.S. EEZ are subject to regulation under MMPA Section 118, mortality and serious injury from such fisheries should be clearly separated from other fishery-related mortality (e.g., mortality incidental to recreational fishing or foreign fishing beyond the U.S. EEZ) in the Reports.

There is a general view that marine mammal mortality information from logbook or fishermen's report data can only be considered as a minimum estimate of mortality, although exceptions may occur. Logbook or fishermen's report information can be used to determine whether the minimum mortality is greater than the PBR (or greater than 10% of the PBR), but it should not be used to determine whether the mortality is less than the PBR (or 10% of the PBR). Logbook data for fishermen's reports should not be used as the sole justification for determining that a particular stock is not strategic or that its mortality and serious injury rate is insignificant and approaching zero.

For fisheries without observer programs, information about incidental mortality and serious injury from logbooks, fishermen's self-reports, strandings, and other sources should be included where appropriate. When these other sources of data are used, particularly as a significant component of the measure of annual human-caused mortality, the following language should be added to the Report: "It is important to stress that this mortality estimate results from an actual count of verified human-caused deaths and serious injuries and should be considered a minimum." Such information should be presented in brackets to distinguish it from estimates of total mortality and serious injury in the fishery. If such information is not included in the table, but reports such as fishermen's self-reports are available, those reports should be described in the text and any concern with the quality of that report should be noted. Fishermen's self-reports of mortality or injuries should not be included if the fishery was observed and incidental mortality and serious injury was estimated based on observer records and associated coverage. Mortality and serious injury by those fisheries not regulated under MMPA Section 118 (i.e., incidental to foreign fisheries or recreational fisheries), should be distinguished from mortality and serious injury incidental to fisheries subject to Section 118. Further guidance on averaging human-caused mortality across years and across different sources of mortality can be found in the Technical Details section of these guidelines.

Because many stocks are subject to human caused mortality or serious injury that is unmonitored or not fully quantified, authors of the Reports should add a sub-section of the Human-Caused Mortality and Serious Injury section to include a summary of the most prevalent potential sources of human-caused mortality or serious injury that are not quantified (e.g., fisheries that have never

[2] In 2012, NMFS implemented a policy to distinguish serious from non-serious injuries (NOAA 2012). This policy and associated procedural directive detail the process by which NMFS evaluates injuries, documents that rationale, and reviews determinations.

been observed, or have not been observed recently, and ship strikes). If there are no major known sources of unquantifiable human-caused mortality or serious injury, this should be explicitly stated. Finally, a description of any additional key uncertainties concerning human-caused mortality or serious injury should be provided, along with an evaluation of the potential effects of these uncertainties on the mortality estimates.

Mortality Rates

Section 118 of the 1994 MMPA Amendments reaffirmed the goal set forth in the Act when it was enacted in 1972 that the take of marine mammals in commercial fisheries is to be reduced to insignificant levels approaching zero mortality and serious injury rate, and further requires that this goal be met within seven years of enactment of the 1994 Amendments (April 30, 2001). This fisheries-specific goal is referred to as the "zero mortality rate goal" (ZMRG). The Reports are not the vehicle for publishing determinations as to whether a specific fishery has achieved the ZMRG. A review of progress towards the ZMRG for all fisheries was submitted to Congress in August 2004.

However, Section 117 of the amended MMPA requires that Reports include descriptions of fisheries that interact with (i.e., kill or seriously injure) marine mammals, and these descriptions must contain "an analysis stating whether such level is insignificant and is approaching a zero mortality and serious injury rate." As a working definition for the Reports, this analysis should be based on whether the total mortality for a stock in all commercial fisheries with which it interacts is less than 10% of the calculated PBR for that stock. The following wording is recommended (typically in the "Status of Stock" section of the Report):

"The total fishery mortality and serious injury for this stock is (or is not) less than 10% of the calculated PBR and, therefore, can (or cannot) be considered to be insignificant and approaching a zero mortality and serious injury rate."

Status of Stocks

This section of the Reports should present a summary of four types of "status" of the stock: (1) current legal designation under the MMPA and ESA, (2) status relative to OSP (within OSP, below OSP, or unknown), (3) designation of strategic or non-strategic, and (4) a summary of trends in abundance and mortality. Based upon descriptions of levels of uncertainties from the Report sections on Stock Definition and Geographic Range, Elements of the PBR Formula, Population Trend, and Annual Human-Caused Mortality and Serious Injury, authors should evaluate and describe any consequences of these uncertainties on the assessment of the stock's status.

Stocks that have evidence suggesting at least a 50% decline, either based on previous abundance estimates or historical abundance estimated by back-calculation, should be noted in the Status of Stocks section as likely to be below OSP. The choice of 50% does not mean that the lower bound of a stock's OSP range is at 50% of historical numbers, but rather that a population below this level would be below OSP with high probability. However, without further analysis and completions of requirements laid out in Section 115, determination of stock status with regard to whether or not it is depleted (or, by extension, strategic based on depleted status) cannot be made. Similarly, a stock that has increased back to levels pre-dating the known decline may be within OSP; however, additional analyses may determine a population is within OSP prior to reaching historical levels.

Section 3(19) of the MMPA defines the term "strategic stock" as a marine mammal stock: (A) for which the level of direct human-caused mortality exceeds the potential biological removal level; (B) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the Endangered Species Act of 1973 [16U.S.C. 1531 et seq.] within the foreseeable future; or (C) which is listed as a threatened species or endangered species under the ESA or is designated as depleted under the MMPA.

The MMPA requires a determination of a stock's status as being either strategic or non-strategic and does not include a category of unknown. If abundance or human-related mortality levels are truly unknown (or if the fishery-related mortality level is only available from self-reported data), some judgment will be required to make this determination. If the human-caused mortality is believed to be small relative to the stock size based on the best scientific judgment, the stock could be considered as non-strategic. If human-caused mortality is likely to be significant relative to stock size (e.g., greater than the annual production increment) the stock could be considered as strategic. Likewise, trend monitoring can help inform the process of determining strategic status.

The MMPA requires for strategic stocks a consideration of other factors that may be causing a decline or impeding recovery of the stock, including effects on marine mammal habitat and prey. In practice, interpretation of "other factors" may include lethal or non-lethal factors other than effects on habitat and prey. Therefore, such issues should be summarized in the Status of Stock section for all strategic stocks. If substantial issues regarding the habitat of the stock are important, a separate section titled "Habitat Issues" should be used. If data exist that indicate a problem, they should be summarized and included in the Report. If there are no known habitat issues or other factors causing a decline or impeding recovery, this should be stated in the Status of Stock section.

References

Barlow, J., S.L. Swartz, T.C. Eagle and P.R. Wade. 1995. U.S. Marine Mammal Stock Assessments: Guidelines for Preparation, Background, and a Summary of the 1995 Assessments. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-6, 73 p.

Moore, J.E. and R. Merrick, editors. 2011. Guidelines for Assessing Marine Mammal Stocks: Report of the GAMMS III Workshop, February 15-18, 2011, La Jolla, California. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-47.

NMFS (National Marine Fisheries Service). 2005. Revisions to Guidelines for Assessing Marine Mammal Stocks. 24 pp. Available at: http://www.nmfs.noaa.gov/pr/pdfs/sars/gamms2005.pdf

NOAA. 2012. National Policy for Distinguishing Serious From Non-Serious Injuries of Marine Mammals. Available at: http://www.nmfs.noaa.gov/pr/pdfs/serious_injury_policy.pdf

Wade, P.R. 1994. Managing populations under the Marine Mammal Protection Act of 1994: a strategy for selecting values for N_{min}, the minimum abundance estimate, and F_r, the recovery factor. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Southwest Fish. Sci. Cent. Admin. Rep. LJ-94-19, 26 p.

Wade, P.R. 1998. Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. Marine Mammal Science 14:1-37.

Wade, P.R., and R.P. Angliss. 1997. Guidelines for Assessing Marine Mammal Stocks: Report of the GAMMS Workshop, April 3-5, 1996, Seattle, WA. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPS-12, 93 p.

Williams, R, Gero, S, Bejder, L, Calambokidis, J, Kraus, SD, Lusseau, D, Read, A, and Robbins, J. 2011. Underestimating the damage: interpreting cetacean carcass recoveries in the context of the Deepwater Horizon/BP incident. Conservation Letters 4(3)228-233.

2. Technical Details

In this section, technical details are given for making appropriate calculations of PBR and mortality. The first section provides details on precision and rounding issues. The second section provides details for combining more than one abundance estimate for calculating N_{min}. The third section contains details for calculating the estimate of annual human caused mortality and its associated variance.

Precision and Rounding

The following rules on precision and rounding should be applied when calculating PBR and other values:

(a) N (the abundance estimate), CV(N), R_{max}, and F_r should be reported in the Report to whatever precision is thought appropriate by the authors and involved scientists, so long as what is reported is exactly what the PBR calculation is based on.
(b) PBR should be calculated from the values for (a) to full precision, and not be calculated from an intermediary rounded off N_{min}. However, N_{min} should be reported as a rounded integer.
(c) PBR and mortality should be reported with one decimal place if they are below 10. Otherwise, PBR and mortality should be reported as a rounded integer.
(d) If PBR and mortality round to the same integer, the Report will report both values to the precision necessary to determine which is larger. This would also be done if 10% of PBR and mortality round to the same integer.

Computation of Average Abundance and its Variance

When estimates of abundance are available for more than one year or from more than one source in the same year, it may be appropriate to combine those estimates into an average abundance for the time period in question. It was agreed that a weighted mean was probably the most appropriate average to use, where the weights are equal to the inverse of the associated variance:

Error!

where:

$$w_i = \frac{1/var(a_i)}{\sum_{j=1}^{n} 1/var(a_j)} .$$

The variance of a weighted mean of several abundance estimates is calculated as:

$$var(a) = w_1^2 var(a_1) + w_2^2 var(a_2) + ... w_2^2 var(a_n) = \sum_{i=1}^{n} w_i^2 var(a_i) \ .$$

Finally, the variance is parameterized as a CV in the provided equation for calculating N_{min}. The CV is calculated as:

$$CV(a) = \frac{\sqrt{var(a)}}{a}$$

Computation of Average Human-Caused Mortality and its Variance

When estimates of human-caused mortality and serious injury (called here "mortality") are available for more than one year and/or from more than one source, such as a fishery, it is necessary to calculate an estimate of the mean annual mortality along with its associated variance (or CV). The following section provides guidelines for doing this. For convenience, the section refers to averaging the incidental bycatch of fisheries, but the guidelines apply equally well to estimates of human-caused mortality from other sources.

<u>Calculating the overall mean annual bycatch</u>

First, it was agreed that it was most appropriate for the bycatch estimates from a fishery to be averaged UN-WEIGHTED across years, as the true bycatch might be different in each year, and thus is not stationary. This is just the simple average of the available estimates of bycatch. If estimates are available from more than one fishery, a mean annual bycatch from each fishery should be calculated first, and then the annual mean from each fishery should be summed to calculate an overall estimate of the mean annual bycatch.

<u>Calculating the coefficient of variation (CV) of the mean annual bycatch of a single fishery</u>

There are two potential methods for calculating the CV or variance of the mean annual bycatch of a single fishery. Method 1 involves using standard statistical formulas for combining the variances of the individual yearly bycatch estimates (assuming they are available). Method 2 involves estimating the variance empirically from the 2-5 years of point estimates of bycatch, which is done by calculating the standard deviation of the 2-5 mortality estimates and dividing it by the square root of *n*, where *n* is the number of years available. Both methods are valid. However, two points favor Method 1.

First, because the true bycatch might be different in each year, and thus is not stationary, estimating the variance using Method 2 above could over-estimate the true variance of the estimates of bycatch, and this positive bias would be related to how much the bycatch truly varied from year to year independent of observation error.

Second, Method 1 is likely to give a more precise estimate of the variance because it has more degrees of freedom. Using Method 2 involves estimating the variance from a sample size of just 2-5, and ignores the information that is known about the precision of each individual estimate.

Obviously, Method 2 is the only method that can be used if there are no estimates of the variance of the bycatch estimates available. Method 1 is the recommended method if the estimates of bycatch in each year do have an estimated variance (or CV).

Method 1

Table 1 outlines the computations needed for estimates of average bycatch mortality by *f* fisheries operating over *n* years. Table 2 gives an example computation for *f*=3 fisheries operating over a horizon of *n*=3 years and all of the estimates are non-zero. Most variance estimators will provide an estimate of 0 for the variance when the estimated mortality is zero; however, the true variance is non-zero. In this case, a more realistic estimate of the variance can be developed by averaging the variances for those years which have a positive variance. The variance computations in Table 1 are simply modified by dividing by the square of the number of years with a non-zero variance. The computation of the average is unaffected with the zero included in the average (Table 3). In certain circumstances a fishery may have been operating but was not monitored for mortality. Missing estimates should be dropped both from the calculation of the average and the variance (Table 4).

Method 2

In Method 2 the only change is in how the variance is calculated for the estimate of average bycatch mortality for each fishery over *n* years. In Method 2 the variance of the average bycatch is estimated empirically from the several point estimates of bycatch available from different years. This is done by calculating the variance of those estimates and dividing it by *n*, where *n* is the number of years used in calculating the average:

$$var(m_{i.}) = \frac{\sum_{j=1}^{n} \frac{(m_{ij} - m_{i.})^2}{n-1}}{n} .$$

The above formula would thus be substituted for the formula for $var(m_{1.})$ presented in Table 1. The second step of combining variances across fisheries is identical to Method 1.

Table 1. Computation table for average mortality for n years with f fisheries. The mortality estimate for fishery I during year j is m_{ij} and the corresponding variance estimate is v_{ij}. The estimated total mortality for year j is $m_{.j}$, the sum of mortality estimates for each fishery and the variance is $v_{.j}$, the sum of the variances. The average mortality for fishery I is $m_{I.}$ and its variance is $v_{i.}$, which is the sum of the variances for each year within the fishery divided by the number of years (n) squared.

Fishery	Year 1	Year 2 ...	Year n	Average
1	m_{11} var(m_{11})	m_{12} var(m_{12})	m_{1n} var(m_{1n})	$m_{1.} = \sum_{j=1}^{n} m_{1j}/n \quad var(m_{1.}) = \sum_{j=1}^{n} var(m_{1j})/n^2$
2 . .	m_{21} var(m_{21})	m_{22} var(m_{22})	m_{2n} var(m_{2n})	$m_{2.} = \sum_{j=1}^{n} m_{2j}/n \quad var(m_{2.}) = \sum_{j=1}^{n} var(m_{2j})/n^2$
f	m_{f1} var(m_{f1})	m_{f2} var(m_{f2})	m_{fn} var(m_{fn})	$m_{f.} = \sum_{j=1}^{n} m_{fj}/n \quad var(m_{f.}) = \sum_{j=1}^{n} var(m_{fj})/n^2$
Total				$m_{..} = \sum_{i=1}^{f} m_{i.} \quad var(m_{..}) = \sum_{i=1}^{f} var(m_{i.})$

Table 2. Example computation of average mortality and its variance for 3 fisheries over 3 years.

		Year			
Fishery		**1**	**2**	**3**	**Average**
1	m	10	3	19	10.67
	v	4	2	8	1.56
2	m	2	13	6	7.00
	v	2	14	4	2.22
3	m	6	33	5	14.67
	v	8	23	4	3.89
Total	m				32.33
	v				7.67

Table 3. Example computation of average mortality and its variance for 3 fisheries over 3 years when some estimates are zero.

		Year			
Fishery		**1**	**2**	**3**	**Average**
1	m	10	0	19	9.67
	v	4	0	8	3.00
2	m	2	13	6	7.00
	v	2	14	4	2.22
3	m	0	0	5	1.67
	v	0	0	4	4.00
Total	m				18.33
	v				9.22

Table 4. Example computation of average mortality and its variance for 3 fisheries over 3 years when some estimates are zero and others are missing.

		Year			
Fishery		**1**	**2**	**3**	**Average**
1	m		0	19	9.50
	v		0	8	8.00
2	m	2		6	4.00
	v	2		4	1.50
3	m	0	0	5	1.67
	v	0	0	4	4.00
Total	m				15.17
	v				13.50

Guidelines for minimum observer sample size requirements
(Avoiding small-sample bias when PBR is small)

Table 6. Recommended data levels to attain approximately unbiased estimation of average annual fisheries-related mortality and serious injury, relative to PBR (i.e., if true annual bycatch = PBR) (from Moore and Merrick 2011). "Approximately unbiased" implies median absolute bias < 25%. The top table recommends minimum observer coverage (annual average), given a certain PBR and level of data pooling (years of information combined). The bottom table recommends minimum levels of data pooling, given a certain PBR and observer coverage. If true bycatch = PBR and sampling effort is below the recommended levels, *median* bias is always negative (i.e., true bycatch > estimate), but the combination of *very* limited sampling (≤5% coverage, ≤ 5 yrs data pooling) and *very* low bycatch (e.g., 1/yr) generates bimodal estimation bias, whereby bycatch is always either underestimated (if no bycatch is observed) or overestimated (if ≥ 1 bycatch event is observed).

	Observer program length (years)								
PBR	1	2	3	4	5	6	7	8	9
1	80%	40%	30%	30%	20%	15%	15%	10%	10%
2	40%	20%	15%	10%	10%	7.5%	7.5%	5%	5%
3	30%	15%	10%	7.5%	7.5%	5%	4%	4%	3%
4	20%	10%	7.5%	5%	4%	4%	3%	3%	3%
5	20%	7.5%	7.5%	4%	4%	3%	3%	2%	2%
6	15%	7.5%	5%	4%	3%	3%	2%	2%	2%
7	15%	7.5%	4%	3%	3%	2%	2%	2%	2%
8	10%	5%	4%	3%	2%	2%	2%	2%	2%
9	10%	5%	3%	3%	2%	2%	2%	2%	1%

Required observer coverage

	Observer coverage											
PBR	1%	2%	3%	4%	5%	7.5%	10%	15%	20%	30%	40 - 70%	80%
1	Always biased	→	→	→	→	→	8	6	4	3	2	1
2	Always biased	→	→	→	8	6	4	3	2	2	1	1
3	Always biased	→	9	7	6	4	3	2	2	1	1	1
4	Always biased	→	7	5	4	3	2	2	1	1	1	1
5	Always biased	8	6	4	4	3	2	2	1	1	1	1
6	Always biased	7	5	4	3	2	2	1	1	1	1	1
7	Always biased	6	4	3	3	2	2	1	1	1	1	1
8	Always biased	5	4	3	2	2	1	1	1	1	1	1
9	9	5	3	3	2	2	1	1	1	1	1	1

Required years of data pooling

3. Descriptions of U.S. Commercial Fisheries

Fisheries table in each stock assessment report

Sample incidental fisheries mortality table to be included in Reports. Each fishery noted as interacting with a stock should be included in the table, even if little information is available. Information on the number of incidental injuries and which injuries should be considered serious should be provided in either the table or the text, if appropriate. See discussion in 5.2 of Wade and Angliss (1997).

Table 7. Summary of incidental serious injury and mortality (SI/M) of stock ___ due to commercial fisheries from 1990 through 1994 and calculation of the mean annual SI/M rate. Mean annual SI/M in brackets represents a minimum estimate from logbooks or MMPA reports.

*Note -- numbers indicated with an asterisk are optional -- different preferences have been expressed in different regions.

Fishery Name [1]	Years	Data Type	Range of Observer Coverage	Observed SI/M (in given yrs.)	Estimated SI/M (in given yrs.)	Mean Annual SI/M
groundfish trawl fishery 1	90-94	obs data	53-74%	13, 13, 15, 4, 9	13, 19, 21, 6, 11	14 (0.32)
groundfish trawl fishery 2	90-94	obs data	33-55%	2, 0, 0, 1, 1	4, 0, 0, 3, 3	2 (0.24)
longline fishery 1	90-94	obs data	23-55%	1, 0, 0, 1, 0	2, 0, 0, 4, 1	1.4 (0.15)
drift gillnet fishery 1	90-91	obs data	4-5%	0, 2	0, 29	14.5 (0.42)
Observer program total						31.9 (0.xx)
set gillnet fishery 1	90-93	log book	n/a	0, 1, 1, 1	n/a	[≥.75]*
set gillnet fishery 2	90-93	log book	n/a	0, 0, 0, 2	n/a	[≥.5]*
longline fishery 2	94	mmap reports	n/a	1	n/a	[≥ 1]*
Minimum total annual mortality						≥ 34.2*

[1] The name should be consistent with fishery names in the List of Fisheries.

General information about a fishery (not stock-specific)

Information to provide

As discussed at the GAMMS workshop, information on U.S. commercial fisheries should be included either within each Report, as an appendix, or as a companion document. Information on U.S. commercial fisheries was collected during the preparation of the Environmental Assessment for the proposed regulations implementing Section 118 (NMFS, 1994). The following information, which was provided for each fishery whenever possible, has direct relevance to managing incidental serious injuries and mortalities of marine mammals:

Fishery name: A description of those fisheries that are classified in Category I or II in the LOF, and those fisheries in Category III that have experienced incidental mortality and serious injury of marine mammals should be provided. The Category of the fishery in the List of Fisheries should be specified in the text.

Number of permit holders: NMFS is required by the MMPA to provide the number of permit holders in each fishery included in the List of Fisheries. Information on the number of permit holders in federal fisheries can often be found in recent amendments to Fishery Management Plans. Information on fisheries that occur within state waters but are managed via an interstate commission may be found in interstate fishery management plans. Information on state fisheries that are managed by individual states can typically be found by contacting the state office responsible for licensing commercial fishing vessels.

Number of active permit holders: Because not all licensed commercial fishers participate actively in each fishery, the number of active permit holders may be different than the number of actual permit holders in a fishery. This is particularly true for fisheries that operate in state waters.

Total effort: Provide an estimate of the total fishing effort, in the number of hours fished, for each fishery. This information is typically available only for fisheries that are both federally managed and observed.

Geographic range: Provide a description of the geographic range of the fishery. The description of the geographic range of the fishery should include any major seasonal changes in the distribution of the fishing effort.

Seasons: Describe the seasons during which the fishery operates.

Gear type: Describe the gear type used in the fishery as specifically as possible. Include mesh size, soak duration, trawl type, depth of water typically fished, etc. if the information is available.

Regulations: Indicate whether the fishery is managed through regulations issued by the federal government, interstate fishery commissions, individual states, or treaty.

Management type: Indicate what types of fishery management techniques are used to manage the fishery. Some examples include limited entry, seasonal closures, and gear restrictions.

Comments: Include any additional relevant information on the fishery.

4. Additional Recommendations of the GAMMS III Workshop

The following recommendations were made by the participants of the GAMMS III Workshop:

(1) In order to provide the kind of information that is required to answer the question "is it plausible that there are multiple demographically independent population stocks (DIPS) within this stock?" (in the revised Definition of Stock section), it is recommended that a national workshop be held to review and summarize information that is relevant to population structure. The workshop should include participation from Headquarters and all Centers and Regions, at a minimum. It is unlikely that the workshop could feasibly review all stocks in all areas. Therefore, a list of priority stocks for consideration should be established prior to the workshop. This might efficiently be done by a Steering Committee with stocks to be reviewed proposed from each region. Stocks should be selected to cover a broad range of geographic and taxonomic diversity (e.g., it might be appropriate to review at least one stock each of phocids, otariids, large whales, delphinids, phocoenids, and ziphiids in each region (if presently recognized). Priority should be given to stocks that are geographically large, span multiple bioregions, or potentially experience substantial human-caused mortality in a portion of their range. It would also be appropriate to examine areas of U.S. waters where stocks have not previously been defined (e.g., Guam, Caribbean). The information to be reviewed should include (at least) all information used for defining stocks as recommended in the Guidelines. This includes distribution and movements, acoustic call types, population trends, morphological differences, differences in life history, genetic differences, contaminants and natural isotope loads, parasite differences, and oceanographic habitat differences (such as marine bioregions). It should be emphasized that the purpose of the workshop is to review and summarize relevant information. As possible and appropriate, the workshop will propose revisions to stock structure. A major objective will be to review the information for these stocks in a manner to provide a template for how to complete review of all stocks in each region.

(2) To recognize that the population dynamics of some stocks (such as Cook Inlet beluga and Hawaiian monk seal) may not conform with the underlying assumptions on which the PBR calculation is based (relevant "PBR elements" section of the guidelines), it was recommended that the next administration MMPA reauthorization bill include the explicit option for setting R_{max} (or F_r) to zero in appropriate cases.

(3) A list of regional and F/PR points-of-contact should be created, in order to implement recommendations of Topics 5 and 9 of the GAMMS III workshop pertaining to the timely annual transmission of information on non-serious injury, serious injury, and or death reported under LOAs and IHAs from F/PR to Regional Offices and Science Centers (including to Report authors).

5. Overview of changes from the 2005 Guidelines

The following additions have been made:

- In the stock assessment report (SAR) sections of the Reports on Stock Definition and Geographic Range, elements of the PBR formula, Population Trend, and Annual Human-caused Mortality and Serious Injury, authors are to provide a description of key uncertainties in each element and evaluate their effects;
- Acoustic call type was added as a type of information that can be used to identify stocks;
- Each SAR will state in the Stock Definition and Geographic Range section whether it is plausible the stock contains multiple demographically independent populations that should be separate stocks, along with a brief rationale;
- Informed interpolation may be used to fill gaps in survey coverage;
- A summary of all human-caused mortality should be included in SARs;
- Text regarding avoiding small sample bias was added;
- For mixed stocks, apportion takes among stocks where possible; otherwise, apply take to each stock in area;
- Direction regarding reporting of mortality and serious injury;
- Stocks that have evidence suggesting at least a 50% decline should be noted in the Status of Stocks section as likely to be below their optimum sustainable population level;
- Trend modeling may be used to determine stock status;
- "Other factors" leading to decline or impeding recovery should be considered, including non-lethal factors;
- Added guidelines for minimum observer sample size requirements; and
- Added section on population trends

The following deletions have been made:

- Removed "undetermined" PBR for unusual cases such as Hawaiian monk seal; instead, calculate PBR if possible and qualify in the report;
- Removed statement that default stock status should be strategic; and
- Removed "sources of information on U.S. commercial fisheries" section

The following changes to text/guidance have been made:

- "Demographic isolation" was changed to "demographic independence" and "reproductive isolation" was changed to "reproductive independence";
- Updated the reference section; and
- Replaced the recommendations from the GAMMS II workshop with recommendations from GAMMS III workshop