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A REQUIREMENTS PLAN FOR IMPROVING THE UNDERSTANDING OF THE STATUS OF U.S. PROTECTED MARINE SPECIES

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Report of the NOAA Fisheries National Task Force for Improving Marine Mammal and Turtle Stock Assessments

September 2004

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U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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Executive Summary

Under the mandates of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA), NOAA Fisheries must regularly evaluate the status of protected species, specifically marine mammal and turtle species. In addition, these laws prohibit the taking of protected species unless a specific exception, usually granted through a permit or authorization, is made for a particular activity that may affect any protected species. Such authorizations require NOAA Fisheries to assess the impacts of the activity on protected species and their habitats, with both done in the context of other anthropogenic and natural factors that may affect the species. Thus, timely, accurate, and precise biological information is essential for NOAA Fisheries to determine the status of each stock or population and to design effective and efficient conservation programs to promote the recovery of the affected populations.

These stock assessment mandates have been supplemented over the past decade by changes in how protected resource management and science are conducted. These changes include: international and domestic interest in observing systems; mapping; ecosystem approaches; demands by courts and the public for greater precision; scientific certainty and transparency in decisions; increased litigation by non-governmental organizations to pursue policy and management agendas; expanding interest by executive branch leadership in partnerships between federal agencies; and the comprehensive NOAA Requirements Planning and Program Review (2002).

To address and meet its mandates, NOAA Fisheries must improve its research capability and capacity, and significantly enhance the quantity and quality of its protected species stock assessment data and analyses. NOAA's Strategic Plan specifically sets the goal to move toward "an ecosystem-based approach to management" where an "*ecosystem*" is defined as a geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics. The "*environment*" is the biological, chemical, physical, and social conditions that surround organisms, and should be qualified as biological, chemical, physical, and/or social. To meet changing demands, NOAA Fisheries must pursue a requirements-based program to increase and improve its protected species stock assessment research activities in the context of broad based, integrated ecosystem investigations.

The plan provided here is designed to provide the basis for improving NOAA Fisheries' protected species stock assessments. The plan explicitly identifies the attributes of a stock assessment that make it reliable, and enumerates NOAA Fisheries' goals for the protected species stock assessment program. The plan reviews the current state of the protected species stock assessment program in terms of present research capability and capacity, and delineates the resources necessary to acquire reliable assessment information. Finally, this plan describes reasonable expectations from the assessment program given current levels of effort and support, and highlights the resource gap between FY03 levels of program effort and the levels required to fully meet the NOAA Fisheries' legislative mandates.

The plan was developed through a series of discussions both within NOAA and with several of its major Federal partners (the U.S. Marine Mammal Commission, Minerals Management Service, and the US Navy). Work was initiated in October 2001 and involved a series of meetings conducted through December 2002. NOAA Fisheries Science Center staff were polled in January-April 2003 to identify: a) the status of all US marine mammal and turtle stocks as of FY2003; b) the resources dedicated to research on these species as of FY2003; c) the resources needs to maintain our level of knowledge on protected resource stocks at the status quo (known as Tier I); and d) the additional resources required to improve the information on the status of all stocks to meet legislative mandates (known as Tier II).

Of the 165 marine mammal stocks assessed by NOAA Fisheries in FY2003, 134 were at Tier I status while 31 had attained Tier II status. Improvements for most stocks are needed in all five data categories: stock identification, abundance, fishery mortality, and assessment frequency and data quality. The greatest need is in stock identification (101 stocks [61%] are deficient in this category). However, significant improvements are also necessary under the remaining four categories.

All of the 13 populations of marine turtles were considered to be at Tier I in FY2003. Major deficiencies exist for almost all of the data categories.

All six of NOAA Fisheries' regional science centers have staffing for marine mammal stock assessments, and all but the Northwest and Alaska are also staffed to assess marine turtles. A few Regional and Headquarters Offices have staff involved in stock assessment work, notably in the conduct of fishery observer programs. As of mid year FY03, 195 NOAA FTE were involved with protected resource stock assessments. This full time staff is supplemented by ca. 200 contract staff, most of which are either survey or fishery observers, although are a few (6) students, interns, and postdoctoral associates. Agency-wide, protected species- fishery observer programs include 156 individuals (36 FTE and 120 contract).

Aircraft and ships are the principal physical resources required to conduct protected species surveys. In FY03, 2094 flight hours (539 flight days) and 765 sea days were used nationally. All Centers use both aircraft and ships in their surveys, though the mix varies significantly. Most offshore cetacean surveys are conducted using high-winged, twin engine aircraft, such as a DeHavilland Twin Otter or a Rockwell Aero Commander. NOAA's Marine and Aviation Operations (NMAO) office is typically the supplier for NOAA Fisheries' use of Twin Otter aircraft. Aircraft needs not met through NMAO (e.g., helicopters and single engine aircraft) are met through charters.

The ship time (765 sea days) required for protected species surveys is provided either by NMAO or by charter. Center staff presently spend a considerable amount of time aboard NOAA vessels, though frequently the vessels are used for purposes other than abundance surveys (e.g., fisheries trawl and long-line surveys). The specialized nature of many protected species surveys (e.g., shallow draft for inshore surveys or two observing platforms) has led to chartering of UNOLS and commercial vessels to supplement the available NOAA vessels.

The Tier I research program will involve no new surveys or observer initiatives, but will make better use of existing programs and data. This level of effort will simply maintain (or restore) the status quo and improve assessments for some species in all regions by making better use of existing data or surveys. However, meeting Tier I needs will require an increase of 377 individuals (137 FTE, 234 contract, six others). Much of this increase in staffing will improve existing fishery observer programs to meet desired levels of precision for mortality estimates. Even without additional surveys, an estimated 345 sea days and 870 flight hours (223 days) are needed to simply maintain the current level of assessments, because significant erosion of research spending power has occurred over the past decade. Fewer sea days or flight hours are available for surveys, which has led to abbreviated surveys and reduced precision of abundance estimates.

To achieve the MMPA and ESA's mandates, all remaining Tier I stocks will need eventually to be reach Tier II. This will involve deploying new surveys and observing additional fisheries. An additional 120 FTE and 386 contract employees will be needed. Again, expansion of observer programs to adequately sample all fisheries with protected species interactions will constitute a major part of this increase (22 FTE and 184 contract employees). Because Tier II assessments typically involve expanded survey effort (e.g., seasonal rather than annual surveys), large increases in platform time requirements will occur. Vessel time will increase by 705 sea days and flight time by 900 flight hours (~222 days). Many of these days and hours will be on chartered vessels or aircraft rather than through NMAO.

Implementation of this plan will take upwards to 10 years. However, the result will be that for the first time NOAA Fisheries will achieve the information requirements of the ESA and MMPA for protected species assessments, and NOAA Fisheries will be significantly closer to achieving an "ecosystem approach to management."

I. Introduction

A. What Is a Protected Species Stock Assessment?

Under Federal law, NOAA Fisheries must assess the status of all protected species, which include all marine mammals, marine turtles, and those marine and anadromous species (e.g., salmonids) that are listed as depleted under the MMPA, or listed as threatened or endangered under the ESA. In addition, these laws also prohibit the taking of protected species unless a specific exception, usually through a permit or authorization, is made for a particular activity that may affect any protected species. Such authorizations require NOAA Fisheries to assess the impact that the activity will have on protected species and their habitats, and these impacts must be considered in the context of other anthropogenic and natural factors that may affect the pertinent species.

A protected species stock assessment (Fig. 1) consists of collecting, analyzing, and reporting information related to the status of protected species and the impacts of human activity upon protected species. The most basic measure of protected species status is an estimate or index of the abundance at any given time. A series of such estimates over time allows an evaluation of the population's trend (i.e., is it increasing, decreasing or stable?). Additional information related to life history, such as rates of growth, sex and age structure of the population, age of sexual maturity, age-specific birth and death rates, and maximum longevity, allow scientists to assess the status of protected species populations more completely than from just abundance and trend information alone.

Other information critical to assessing the impacts of human activities includes the magnitude of human-caused mortality, injury or stress; the seasonal distribution and regional densities of protected species; the impacts of natural environmental variability on the population; and the status and abundance of prey and predators. To evaluate the impact of anthropogenic activities on protected species, NOAA Fisheries uses population information along with information on the nature and scope of human activity in an affected area to estimate the likelihood that protected species will encounter human activity and to predict the impact of that activity (along with other activities) on the affected protected species and their habitats.

B. Why Develop a Protected Species Requirements Plan?

The protected species stock assessment program is a fundamental part of the conservation program required under Federal law. Statutes specifically require that NOAA Fisheries evaluate the status of marine mammals and threatened or endangered species according to a defined schedule. These laws also prohibit the taking of protected species, with specific exceptions that usually can be only applied if the taking is shown to be safe for the affected stocks or populations. Thus, timely, accurate, and precise biological information allows NOAA Fisheries to determine the status of each stock or population as required by law and to design effective and efficient conservation programs to promote recovery of affected stocks. Another important function that is enabled

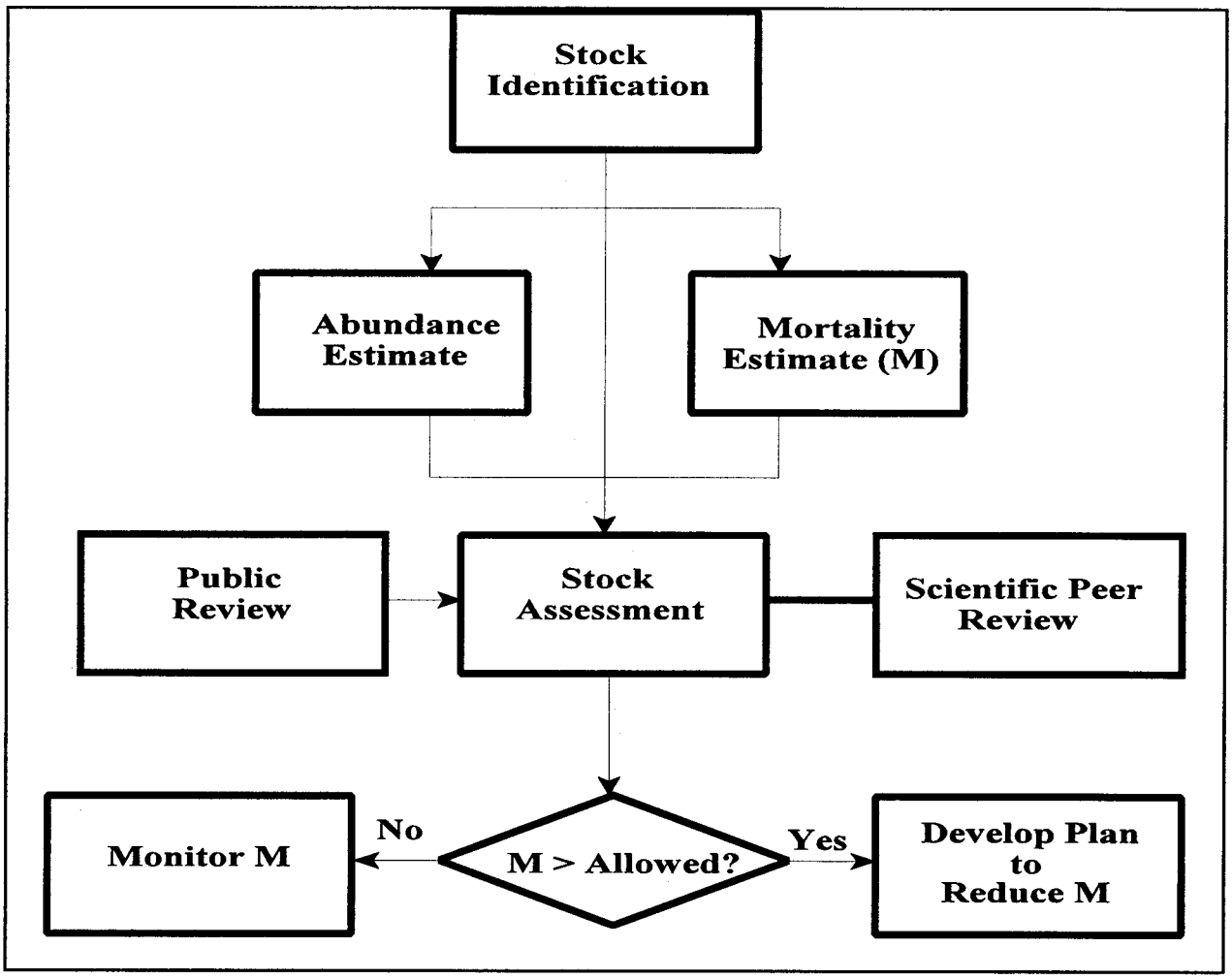

Figure 1. Conceptual model of the stock assessment process.

by reliable information on the status of protected species and the impacts of human activity is the design of regulatory programs on commercial, recreational, and other activities in marine environments that ensure appropriate levels of protection as required by law; such regulatory programs would ensure the conservation of the affected stocks, but not over-regulate the affected industries.

This protected species requirements plan has several purposes. First, the plan explicitly identifies the attributes of a stock assessment that make it reliable, and enumerates NOAA Fisheries' goals for the protected species stock assessment program. The plan also reviews the current state of NOAA Fisheries' protected species stock assessment program and delineates the resources required to acquire reliable assessment information. Thus, the plan describes reasonable expectations from the current protected species assessment and highlights the resource gap between current levels of program effort and the levels

necessary to fully meet NOAA Fisheries' protected species mandates.

The goal of improving the stock assessment program is to provide sufficient information for NOAA Fisheries to make protected species management decisions based upon reliable scientific information. Such a decision making process would allow American society to enjoy maximum benefits of living marine resources while ensuring that the uses of these resources do not have a significant adverse impacts on species or resources that society has chosen to protect through Federal law.

As the utilization of marine resources continues to increase, improved stock assessment programs will be required to achieve the appropriate balance between increased use of resources and environmental protection. As stock assessments improve, managers will be able to increasingly address the cumulative and indirect effects of various human activities and natural environmental variability on protected species. The scientific framework for detecting, monitoring and evaluating cumulative and indirect effects on species is insufficient.

Improving the quantity and quality of protected species status information can only be achieved by enhancing and enlarging capabilities for gathering and analyzing information on status. New "ecosystem approaches" need to be developed to integrate physical, biological, chemical and socioeconomic factors affecting protected species and their habitats. Scientifically accurate and timely information to support such "ecosystem" programs must be available to support comprehensive conservation management. Integrated research and monitoring programs need to be implemented to satisfactorily address the questions arising from increased utilization of living marine resources.

C. The Process by Which the Plan Was Developed

This plan was developed through a series of discussions within NOAA and with several of its major Federal partners (the U.S. Marine Mammal Commission, Minerals Management Service, and the US Navy). Work was initiated at a meeting of NOAA Fisheries Assistant Regional Administrators for Protected Resources held in St. Petersburg Beach, Florida in October 2001. This was followed by meetings in June and August 2002 between NOAA Fisheries and its Federal partners to define their management information needs. As discussions ensued, it became apparent that protected species information needs encompassed more than just the traditional stock assessments. At this same time, a questionnaire was distributed to NOAA stock assessment scientists to elicit their qualitative perspectives on the strengths and deficiencies in protected species stock assessment science.

In September 2002, representatives from NOAA Fisheries' Science Centers and Regional Offices met in Falmouth, MA to define the current condition of protected species stock assessments, and to develop a strategy for improving these assessments that would meet Agency mandates under MMPA and ESA, as well as the collateral data needs of its partners. Regional Office and Headquarters staff met again in

December 2002 to finalize the list of data needs.

Based on these activities, all of the NOAA Fisheries' Science Centers were polled in January-April 2003 to identify: a) the status of all US marine mammal and turtle stocks; b) the current fiscal and personnel resources dedicated to research on these species; and c) the resources needed to maintain the status quo level of knowledge (known as Tier I) and the resources needed to improve the status of information on all stocks to meet legislative mandates (known as Tier II). Additional discussions recurred between NOAA marine turtle scientists and managers at a workshop in August 2003 to refine the marine turtle research component of the plan.

This report documents the results of all of these discussions and provides the final recommendations for improving NOAA Fisheries' protected species stock assessment program.

D. Relationship to the Marine Fisheries Stock Assessment Improvement Plan (SAIP)

In October 2001, NOAA published a companion document titled *Marine Fisheries Stock Assessment Improvement Plan, Report of the National Marine Fisheries Service National Task Force for Improving Fish Stock Assessments* (NMFS 2001). This plan was developed largely through the efforts of a task force of assessment scientists from the NOAA Fisheries Science Centers. The protected species requirements plan has been structured in a very similar format. The similarity between the two documents is intended to simplify interpretation and

implementation of the two plans. Both employ a "level of data" approach to classifying the level of knowledge about individual stocks, and both use "tiers of knowledge" to evaluate data with respect to requirements under the key legislative mandates (MSFCMA for fisheries and the MMPA/ESA for protected species).

The Protected Species plan, however, extends the data requirements beyond simple stock assessments (which are largely focused on stock identification, estimation of abundance and mortality) to include the data needs of the Regional Offices and NOAA's partners to support management. None the less, the ultimate goal of both plans is the same: to improve the quality of assessments for all stocks managed by NOAA Fisheries.

A number of plans and initiatives which complement both the Plans. Examples include the NOAA Fisheries Data Acquisition Plan, NOAA Fisheries Science Assurance Quality Plan, NOAA's Ocean Exploration Program, and the Census of Marine Life Program. These and other programs are summarized in the Marine Fisheries SAIP.

Lastly, this Plan provides a key to the achievement of NOAA Fisheries' primary mission goal under the 2005-2010 Strategic Plan which is to "Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-based Management." It is envisioned that only through implementation of the recommendations in this protected species

SAIP that the Protected Species elements of NOAA's Mission goal will actually be achieved.

E. Scope of This Requirements Plan

The intent of this document is to describe the staffing, fiscal and logistic resources needed by NOAA Fisheries to fulfill its mandates under the MMPA and ESA. To that end, the report has been divided into three sections. Chapter II discusses NOAA Fisheries' stock assessment mandates. Chapter III presents a framework for assessing the status of marine turtles and mammals with respect to these mandates, and provides the results of the application of this framework to assess the status of all US stocks of marine mammals and turtles. Chapter IV reviews the resources currently dedicated to protected species research and assessments, and identifies the additional resources needed to maintain the status quo level of knowledge (Tier I) and to adequately meet NOAA's legislative mandates (Tier II)

This plan only deals with two groups of taxa within the NOAA Protected Species trust: mammals and turtles. There are a number of other protected marine species (fish and invertebrates) which the Agency assesses, but which are not included in this Plan.

II. Defining NOAA Fisheries Protected Species Stock Assessment Mandate

A. Legislative Mandates

NOAA's primary mandates for managing marine protected species are the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). NOAA Fisheries has both science and management requirements under these statutes. The Sections of these statutes are described in Appendix I. Appendix Table 1 presents a summary of NOAA Fisheries activities by mandates with Appendix Table 2 listing the data necessary to fulfill these mandates.

1. The Endangered Species Act (ESA)

Key elements of the ESA with respect to protected species stock assessments can be found under Sections 4 and 7. Section 4 of the ESA covers listing/delisting and recovery planning activities and requires the Secretary to determine if a species is endangered or threatened based on five criteria, determine if a listed species should be removed from the list, identify critical habitat (if applicable) and develop recovery plans that specify management activities that provide for recovery. In order to accomplish listing and recovery under the ESA, information about the following must be assessed: threats to habitat, utilization of the species, impacts of disease/predation; quantitative assessment of other impacts, natural or manmade (human-related mortality), species abundance & trends, population structure, evaluation of existing regulatory mechanisms, and evaluation of existing conservation mechanisms. These are a combination of science and management needs.

Section 7 of the ESA contains the consultation provisions for Federal actions. NOAA Fisheries must determine whether the action permitted, funded or carried out by any Federal agency is in compliance with the jeopardy and adverse modification of critical habitat standards. NOAA Fisheries works with action agencies to evaluate their activities, when requested, and if adverse effects are likely to occur, works with the agency to eliminate to minimize those effects, consistent with the original action.

The analyses of the effects of an action require a suite of data and information similar to that required for listing and recovery. The consultation provisions use a survival standard and then require conservation actions to minimize taking that may still occur after jeopardy or adverse modification of critical habitat is no longer an issue. This again is a combination of science and management needs. Enough data and information on the species status and expected impacts from the action are needed to make the best decisions: decisions that minimize both the effects of an activity on listed species and the socioeconomic implications of the changes to the proposed action, consistent with its original purpose. Otherwise, in the face of uncertainty, the ESA requires the benefit of the doubt be given to the species and can result in overly precautionary and costly measures that, with better information, may have been avoided.

2. The Marine Mammal Protection Act (MMPA)

The key provisions of the MMPA with respect to stock assessments are Sections 117 and 118. Section 117 of the MMPA contains the stock assessment provisions. The legislation provides a clear prescriptive mandate from Congress to "prepare a stock assessment report for each marine mammal stock which occurs" in U.S. waters, "each stock assessment, based on the best scientific information available, shall-- (1) describe the geographic range of affected stock, including any seasonal or temporal variation;(2) provide for such stock the minimum population estimate, current and maximum net productivity rates, current population trend, including a description of the information upon which these are based; (3) estimate the annual human caused mortality and serious injury of the stock by source and , for a strategic stock, other factors that may be causing a decline or impeding recovery of the stock, including effects on marine mammal habitat and prey; (4) describe commercial fisheries that interact with the stock, including –approximate number of vessels actively participating in each such fishery; the estimated level of incidental mortality and serious injury of the stock by each such fishery on an annual basis; seasonal or area differences in such incidental mortality or serious injury; and the rate.....of such incidental mortality or serious injury etc... and (5 & 6) categorize the stock and estimate its potential biological removal levels (PBR).

Section 118 addresses taking of marine mammals incidental to commercial fishing operations. The two most prominent features of this section's required capabilities are to maintain a list of fisheries that describes the level of marine mammal interactions and to conduct "take reduction teams" for strategic stocks whose fishing mortality exceeds their potential biological removal level. How these teams are conducted is also specifically described in the Act, including team composition, duration of planning, and the use of a consensus-based negotiation process. This section instructs that Congress's ultimate goal is to reduce incidental mortality due to commercial fishing to levels approaching a "zero mortality rate". Thus, this section adds a number of administrative and analytical requirements to the scientific information discussed in the paragraphs above, that describes species status and population impacts. Additional analytical responsibilities include modeling to assess management strategies proposed by the teams and fishing gear technology testing. Administrative capabilities beyond take reduction team support include registration of fishermen participating in fisheries with high or occasional takes of marine mammals, a self-reporting process, and monitoring through observer coverage.

B. Changing Demands

The demand for protected resource scientific investigations and status of stock information has increased in the last decade, and this demand is dictating how protected resource management and science needs to proceed in the future. Forces that are driving these changes include increasing interests in international and domestic ocean observing systems, coastal and ocean habitat mapping, ecosystem approaches to

management for all living marine species, and legal challenges to the adequacy and accuracy of the scientific basis of NOAA Fisheries' regulatory actions and permits for takes of protected species.

Increasingly, litigation is being used to pursue policy and management agendas by non-government organizations, commercial and industrial interests which are regulated by NOAA Fisheries. Frequently, the agency's actions are found to be "arbitrary and capricious" owing to the reality that the "best available" information on protected species is insufficient to support the proposed mitigation actions and/or permit requirements. In their rulings courts point out the need for greater accuracy and precision of scientific information, clear measures of scientific uncertainty surrounding these data, and transparency surrounding the process on which management decisions are based.

All of these demands have fueled the need for improved information on the status of protected resource populations, and for improvements in the methods and techniques utilized to assess these species.

In its 2005-2010 Strategic Plan NOAA has broadened its mission to include "understanding and predicting changes in the Earth's environment to conserve and manage coastal and marine resources to meet our Nation's economic, social, and environmental needs." In doing so, NOAA has broadened and increased the information requirements from its component agencies, including NOAA Fisheries. NOAA's Strategic Plan specifically sets the goal of moving toward "an ecosystem-based approach to management" where an "*ecosystem*" is defined as a geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics. The "*environment*" is the biological, chemical, physical, and social condition that surrounds organisms, and when appropriate, should be qualified as biological, chemical, physical, and/or social. These terms define the specific scientific information standards, needs and research requirements for NOAA Fisheries' protected species management programs.

NOAA Fisheries has insufficient resources to meet legislative mandates and attain the mission goals of the Agency with respect to protected species programs. The Agency, however, has the primary management responsibilities to conserve and protect these species. Absent sufficient resources, the alternative is to promulgate conservative, costly and sometimes burdensome mitigation measures upon constituents to minimize the risk to protected species populations.

Some Federal agencies have invested their own resources to complement NOAA Fisheries' efforts to address protected resource issues that are directly relevant to their interests. For example, NOAA Fisheries invests approximately $100,000 annually to investigate the effects of ocean noise on populations of protected species. The US Navy, however, invests approximately $7 million annually in marine mammal and turtle related acoustics research, specifically directed at evaluating the effects of sonar systems and other operational noise on individual animals. Similarly, the Minerals Management Service invests millions of dollars each year to

monitor, define, and assess the effects of coastal and offshore oil and gas exploration, development, and production activities on protected species and their habitats.

Such partnerships between NOAA Fisheries and other agencies provide the means by which adequate information on the potential effects of Navy and oil and gas industry activities might be obtained and evaluated as required by law.

With or without its partners, NOAA Fisheries must undertake research to acquire the information needed to support management actions, particularly concerning controversial activities. Inadequate understanding of the potential adverse impacts of some permitted activities drives this research. Scientific uncertainty involving these potential effects has often led to litigation that has blocked research on those activities that would provide the scientific basis for reasonable mitigation actions. Consequently, the courts and NOAA Fisheries have had to impose conservative and often burdensome requirements on their constituents, rather than pursue research that would furnish information needed to develop reasonably prudent mitigation measures.

For many protected species an important consideration is obtaining information on stock status as it relates to potential takes in specific operational areas (e.g., coastal development, Navy operation and test ranges). Information on the density, abundance and distribution of these species in specific time and area windows is required to assess the potential adverse effects of a proposed activity in terms of "takes" of protected species. In most cases, NOAA Fisheries' protected resource surveys cover broad areas of ocean and coastline and it is not possible to routinely develop estimates of animal densities for specific subareas of interest.

An additional research challenge is the need to develop clear criteria defining "harassment" in the context of assessing the effects of noise and other anthropogenic activities (e.g., ship disturbance, whale-watching activities, recreational viewing of marine mammals) on the behavior and health of protected species. In this regard, it is desirable to develop a national protected resource database that contains current information on the status, abundance, seasonal distribution and habitat requirements for all protected resource species. If such a database also included sources and levels of anthropogenic noise, the potential effects of noise and other disturbance associated with a particular activity in a particular area could be evaluated with respect to the species and numbers of animals potentially affected. Over time, such a database could generate an "ocean noise budget" that would have predictive capability for all living marine resources and that could be used as a guide for mitigating ocean noise from ongoing industry and development.

Collection of survey data and ancillary observations, including complementary oceanographic and habitat information, is presently not an integrated process. Individual data sets (e.g., sightings, acoustic detections, physical oceanographic measurements, prey density data, etc.) are currently integrated post-collection, and this is a labor-intensive costly exercise which delays the analyses of findings, is not

conducive to an integrated "ecosystem" approach, and is further subject to process errors. Developing and implementing integrated data collection systems on NOAA's research platforms would improve the accuracy, utility, and timeliness of protected resource survey information, and advance NOAA Fisheries' protected species stock assessment capabilities.

As data acquisition capabilities improve, and the volume and complexity of information increases, additional analytic staff will be required. At present, NOAA Fisheries' protected species analytical potential is limited because available staff resources must concentrate on specific target species rather than analyzing ecosystem information in a broader, more comprehensive context.

Accurate forecasting of protected species distribution and abundance will also depend on development of predictive modeling techniques. Development of such techniques remains to be established as a routine operational activity within NOAA Fisheries' Protected Species programs.

In recent years NOAA Fisheries has begun to develop passive acoustic methodologies to augment its traditional visual survey methods for marine mammals. These programs are examples of the potentially significant improvements to standard research techniques that application of new technologies can achieve. Traditional visual surveys are limited to daytime and periods of relatively calm weather. The addition of passive acoustic detection methodologies allows survey efforts to continue during nighttime and during periods of winds and fog that prohibit effective visual survey operations, thereby increasing the data gathering capabilities of protected species survey efforts. Similarly, autonomous acoustic recording devices can gather marine mammal, ship traffic, and other acoustic information over prolonged periods of time not achievable by ship or aircraft surveys alone. Other sensor packages may be attached directly to individual animals to record behavior below the surface, received noise levels, and environmental information at depth, all never before possible for protected resource species. The greatest impediment to further development of technologies to improve protected resource information gathering is funding.

Another means for increasing and improving NOAA Fisheries' protected species research capabilities is leveraging resources by participating in other marine research programs. Such a program is the "Census of Marine Life" where multiple government and non-government contribute their specific information on marine resources to build a compendium of related information from many sources. The contributors then have access to information collected by other institutions and agencies to complement data collected for their specific purposes. To date, NOAA Fisheries's participation and contribution to the "Census of Marine Life" has been limited by budgetary constraints, but the potential for improving the database for protected resource objectives through this and similar programs is great.

In summary, increased protected resource research capability and capacity is required to develop a more complete picture of protected species status and the consequences of their interactions with human activities and within their ecosystem.

This information is required at the population level over long time periods in the broadest sense down to small spatial and temporal scales to evaluate specific activities. To be most useful in formulating responsible and scientifically defensible management actions. Without the capability to operationally produce scientifically sound information on the status of protected species, the public will continue to employ litigation to challenge management decisions designed to protect, conserve, and recover protected resource populations and their habitats. To meet the challenging demands for protected resource information, NOAA Fisheries must pursue a requirements-based program to enhance and expand its protected species stock and ecosystem investigations. This stock assessment improvement plan is designed to provide the logic and justification for NOAA to invest in new research to meet its mandates, mission, goals and objectives.

C. Perspective of Individual Scientists

Another tactic to determine NOAA Fisheries protected species stock assessment needs was to poll the individual scientists for their opinion on how stock assessments can be improved. These were used:

- To identify the most important factors hampering the Agency's ability to provide accurate, precise, valid, and credible stock assessments as well as information on seasonal distribution and abundance of marine turtles and mammals

- To determine the resources (e.g., marine mammal and turtle survey data collection programs; data collection programs for fishery statistics; hire additional stock assessment scientific staff; hire additional NOAA Fisheries staff such as survey personnel, technicians, database managers, computer programmers; obtain for ship/aircraft time) needed to improve the Agency's ability to develop credible assessments

- To determine how such needs vary by region

- To use such information to develop specific proposals for new or expanded research programs, additional staff (including specific information on where, when and how many are needed), and other budget initiatives, if NOAA Fisheries determines that such would be beneficial.

A questionnaire (Appendix II) was directed at stock assessment scientists (those who use and/or are involved in some component of the development of stock assessments), as these scientists have a good understanding of the deficiencies, if any, in the input data and/or models used in stock assessments. A similar questionnaire was used to develop the Marine Fisheries Stock Assessment Improvement Plan (NMFS 2001).

Questionnaires were distributed to each of the NOAA Fisheries Science Centers, and responses were received from 17 key stock assessment scientists. Three responses reflected marine turtle needs, eight were for pinnipeds, and 11 were for cetaceans (some scientists responded for more than one taxa). Results are summarized in Appendix III.

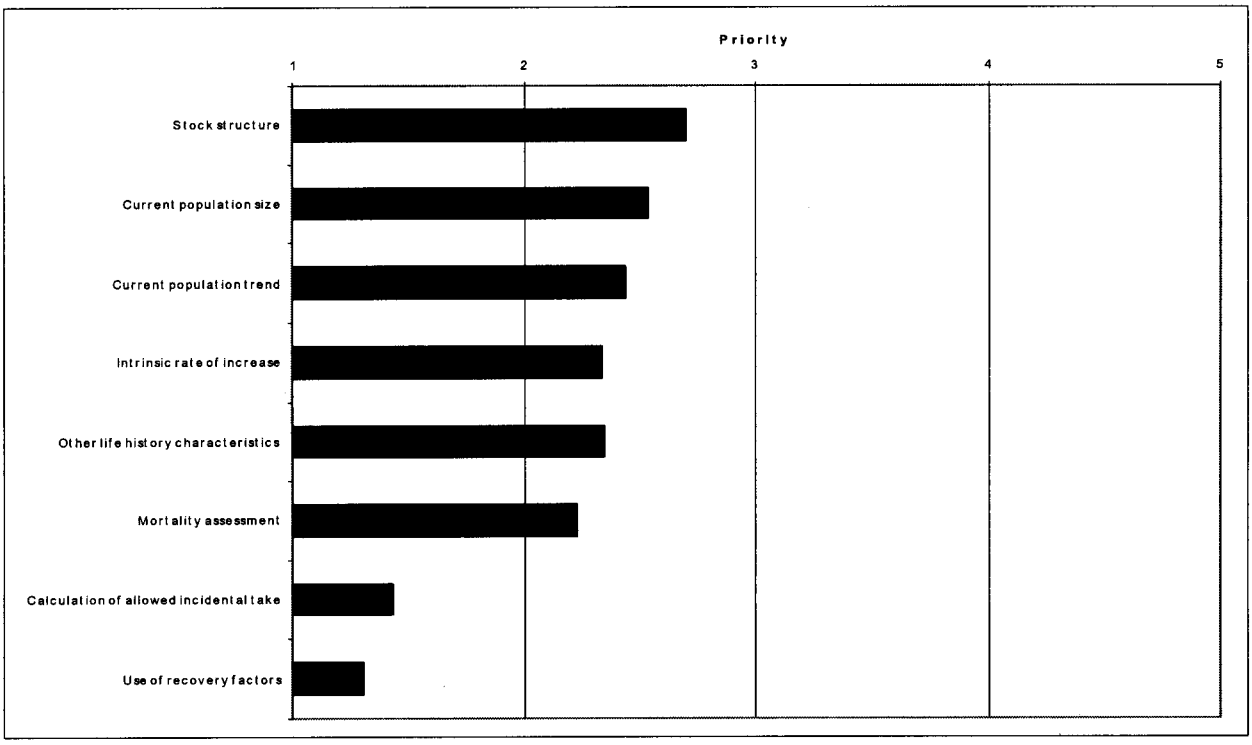

Figure 2. Priorities for general improvement in data collection for protected species stock assessments averaged across NOAA Fisheries Science Centers and taxa based on a survey of 17 NOAA stock assessment scientists. For ease of interpretation priorities have been reordered from the questionnaire so that 1 is lowest priority and 5 is highest.

Questions 1 through 3 dealt with identification of the assessment topics most in need of improvement. Generally, the greatest needs were for improvements to abundance surveys, stock identification and mortality assessment (Fig. 2). Somewhat different needs were identified for marine turtles where current abundance, life history characteristics, and a calculation of allowed incidental take were considered most important.

Priorities shifted somewhat when scientists were asked which data collection efforts require more funding. Funding for fishery observer programs became the clearest priority (Question 2) followed closely by data on abundance (annual and seasonal). Data on stock structure still remained in the first tier of critical information needs.

In response to Question 3 respondents indicated that, in terms of importance to the assessment of the species or species groups studied, the most important items were the quality of the abundance surveys, bycatch estimates, and stock structure.

Questions 4 and 5 asked for a ranking of specific components of the abundance surveys and mortality estimates in terms of their impact on assessments. Priorities for abundance surveys were identified as sampling frequency, use of acoustics, mark and recapture studies, and tagging (Fig. 3). Overall, the most important needs were related to tagging (distribution/movement studies and tag development), and survey frequency (especially for more frequent annual and seasonal surveys). Improvements to other survey tools (e.g., satellite imagery, LIDAR, photogrammetry)

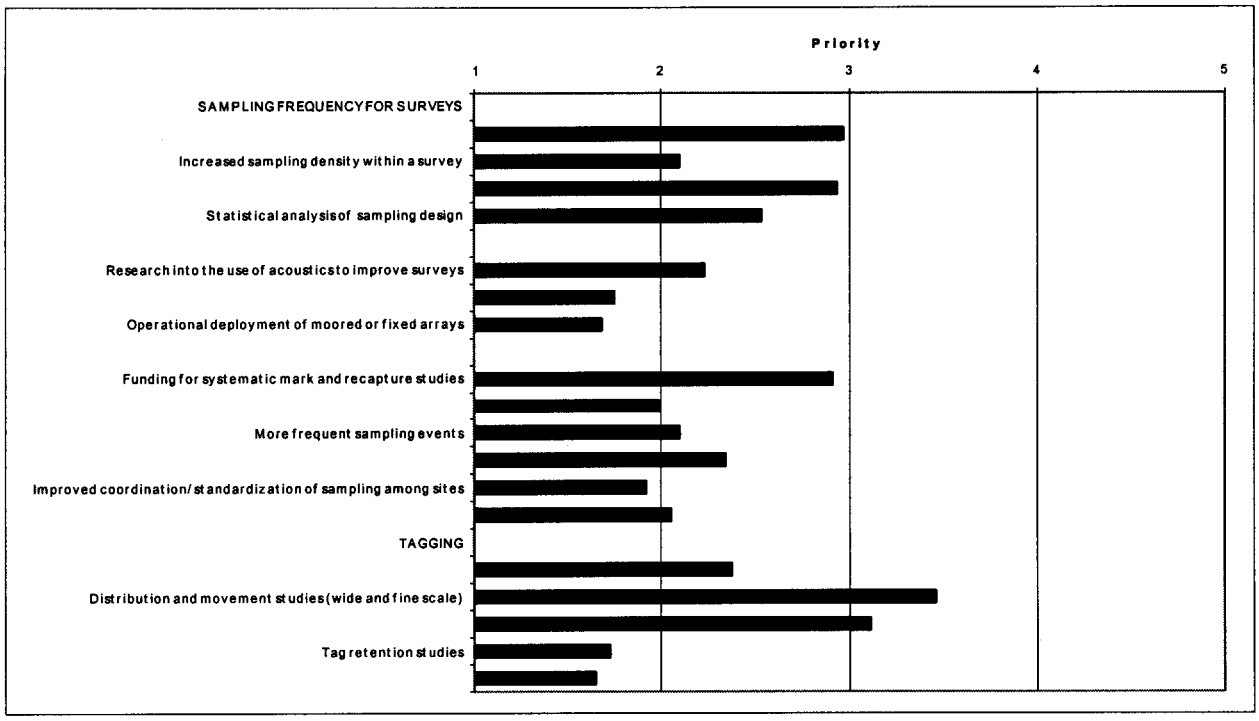

Figure 3. Priorities for improvement in abundance surveys averaged over NOAA Fisheries Science Centers and taxa resulting from a survey of 17 NOAA stock assessment scientists.

or software, while needed, were of lower priority. However, improvements to physical and human resources were of high priority as were increases in aircraft and ship time. More survey personnel were needed.

The highest priority for the collection of data on mortalities of marine mammals and turtles was the expansion of fishery observer programs (Fig. 4). Improving the quality and quantity of staff to estimate mortalities was the next most important need.

In questions 6 and 7, scientists were asked to estimate the percentage of time currently spent on various protected species activities, and then to estimate where the ideal amount that one should spend on each activity (Fig. 5). Not surprisingly, there were a number of significant mismatches. Center scientists would prefer to spend more time conducting research to improve the assessments and in professional development (e.g., writing, attending scientific meetings). They would like to spend less time providing management advice and in administrative activities. Similar results were obtained when fishery assessment scientists responded to similar questions as part of the Marine Fisheries Stock Assessment Marine Fisheries Stock Assessment Improvement Plan.

Question 8 asked individual scientists to identify additional training/professional development opportunities that would best help Agency protected species scientists meet present or future assessment challenges. With respect to training, more education in statistical methods was the

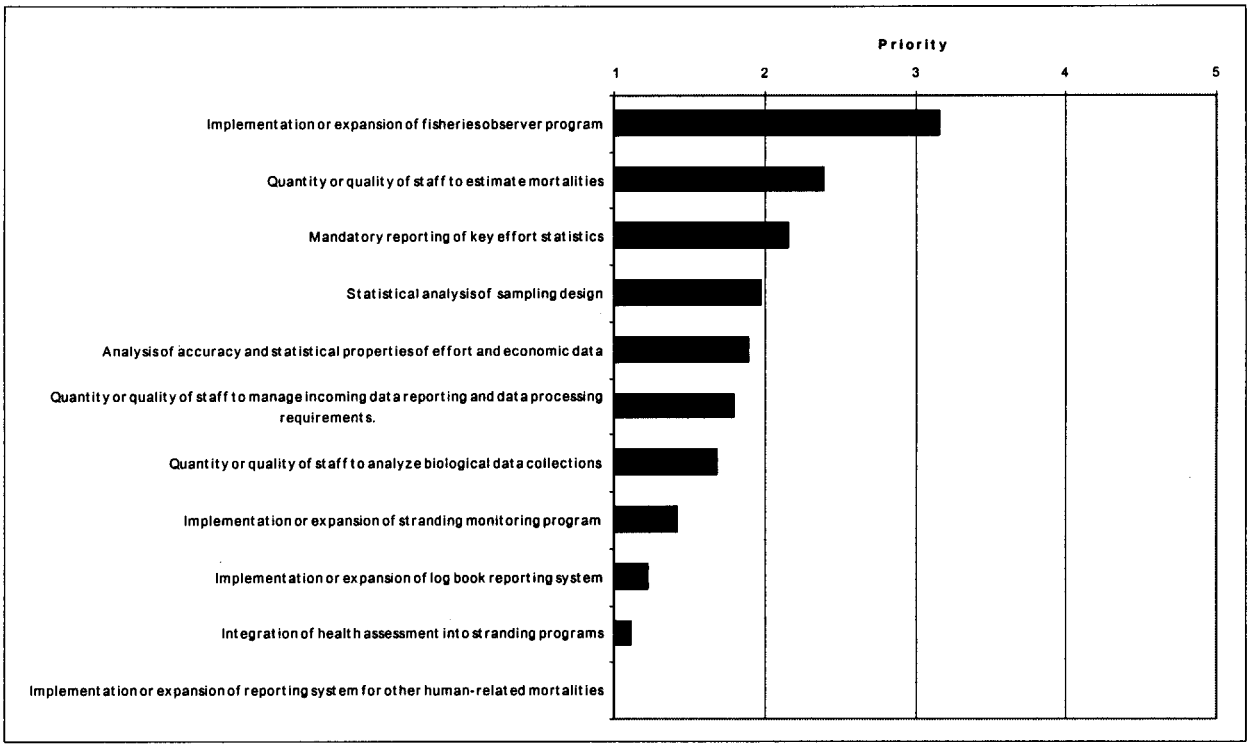

Figure 4. Priorities for improvement in mortality estimation averaged across NOAA Fisheries Science Centers and taxa based on a survey of 17 NOAA stock assessment scientists.

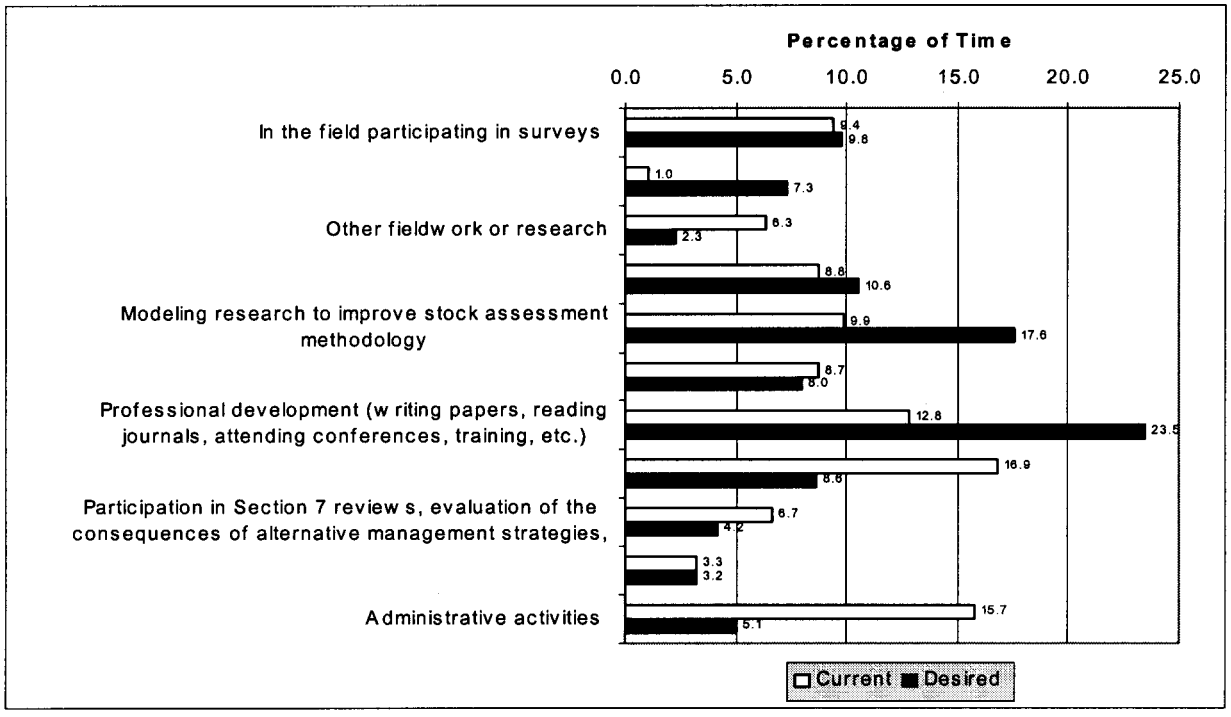

Figure 5. Estimated percentage of time currently spent on activities (clear bar) compared to desired percentages of time (black bar) averaged across NOAA Fisheries Science Center based on questionnaires from 17 NOAA stock assessment scientists.

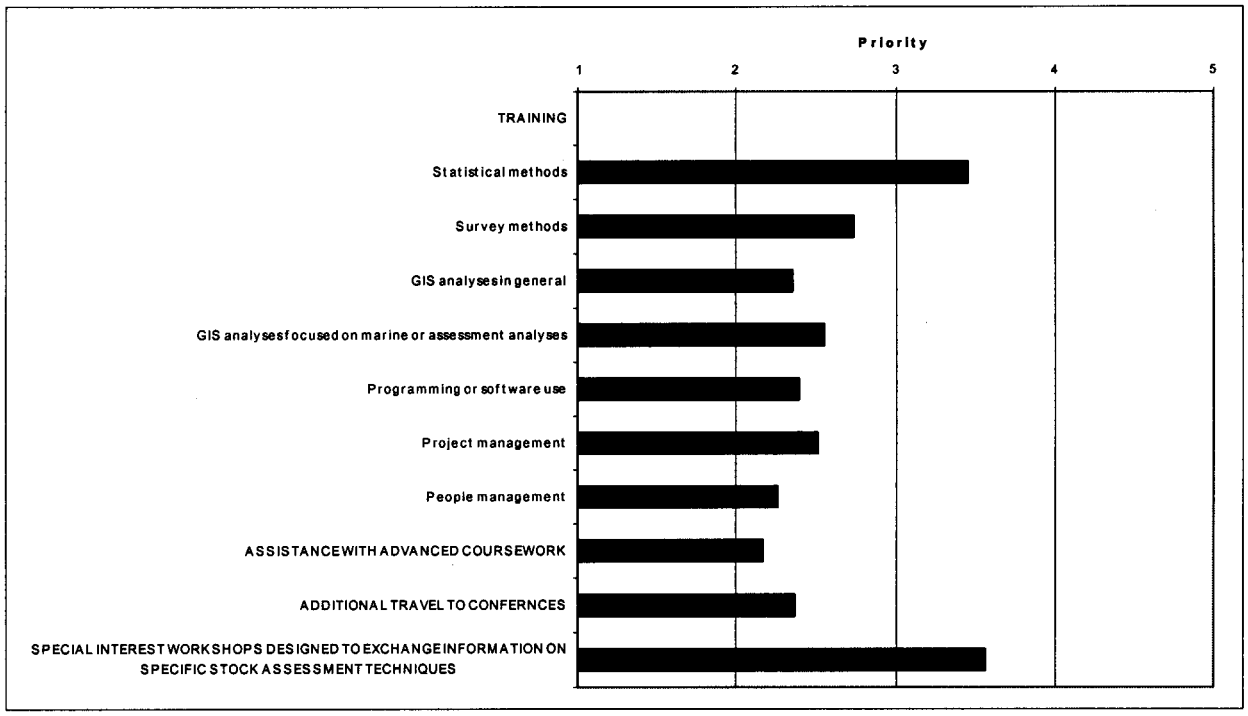

Figure 6. Priorities for professional development averaged across all NOAA Fisheries Science Centers based on a survey of 17 NOAA stock assessment scientists.

was the highest priority (Fig. 6). Special interest workshops designed to exchange information on specific stock assessment techniques were also highly desired. These could be similar to the NOAA Fisheries National Stock Assessment Workshops held for marine fishery stock assessment scientists.

D. Defining Tiers I and II (the Woods Hole Workshop)

During September 2003, a three-day workshop was held with staff from all of the Science Centers, Regional Offices, NOAA Fisheries Headquarters (F/PR and F/ST), and the Marine Mammal Commission to address the following issues related to the development of a protected species requirements plans:

- Identify which data were key to the assessments
- Develop criteria which could be used to classify the levels of knowledge for each data item
- Develop a cross-reference between the levels of knowledge and the information requirements of the ESA and MMPA mandates

Five data items as essential to assessments: stock identification, abundance, fishery mortality, assessment frequency, and assessment quality. A sixth item (life history characteristics) was subsequently added from discussions with the turtle research community.

A five level system (0-4) was developed for classifying the knowledge available about

each data item for each stock. Another systems was developed to characterize the status of knowledge about each stock with respect to stock assessment mandates:

- **Tier I – Improve Stock Assessments Using Existing Data Collection Resources**: This tier maintains the status quo with no new assessment efforts. Much of the cost of Tier I stems from the need to recover the Agency's erosion of resources due to a lack of funding increases over the past decade. The quality of some stock assessments will improve under Tier I due to the application of techniques developed in recent years. However, the quality of many stocks' assessments would still remain deficient at Tier I.

- **Tier II – Elevate Stock Assessments to New National Standards of Excellence:** At this Tier the quality of all stock assessments should achieve a level commensurate with ESA and MMPA mandates. This will require a significant increase in staffing and platform resources.

Further details of these levels and the tiers are provided in Section III below.

E. Moving Beyond an Evolutionary Approach – Tier III and Future Workshops

Development of the plan through Tiers I and II represents a simple evolution of past practices, however, current methods would not provide all the information required by a changing NOAA. The evolving information needs of NOAA and its partners require a host of data items (Appendix Table 2) that have not traditionally been collected as part of stock assessment efforts. To meet NOAA's ESA/MMPA mandates information is needed on:

- Effects and exposure to threats
- Habitat data
- Behavioral and physiological data

These themes and needs are subsumed under "Tier III - Next Generation Assessments". Because the methods needed to collect the types of data required under Tier III are unclear at the present, and large uncertainties remain at to what constitutes an "ecosystem-based" approach to marine mammal or turtle assessment, it is proposed that NOAA Fisheries' convene an international workshop of both protected species and fishery biologists to fully address this issue.

III. Evaluation of Stock Assessment Data Needs

A. Defining the Matrix of Needs

Discussions within NOAA Fisheries and with NOAA's partners at the MMS, USN, and MMC focused on developing a complete list of data categories necessary to fulfill the mandates of the MMPA and ESA. As such, the list extended well beyond the data necessary to meet traditional stock assessment needs[1]. For each data category identified, an evaluation was conducted of the quality of knowledge for that category and a rank assigned from 0 to 4, with 0 being the lowest level of knowledge (no data) and 4 the highest level. Rankings were hierarchical so before a higher level of knowledge could be achieved, all the lower levels fist had to be met.

It was recognized that it would be difficult, if not impossible, to:

- Collect all of the data identified for all species within the NOAA trust mandate, and
- Obtain the highest "level" of knowledge for each species.

Thus, a tiered approach was developed which focused on achieving a baseline level of data collection for a core set of data categories for all species to meet the basic mandates of the ESA and MMPA. More extensive data collection would occur for a limited number of species of special concern.

B. Data Categories

Five general data categories, each with a number of subcategories, were identified:

- Population characteristics (4 subcategories)
- Population threats (7 subcategories)
- Assessment of population threats (2 subcategories)
- Habitat (3 subcategories)
- Behavior and physiology (4 subcategories)

Some subcategories of data were identified as critical for management of all species. These including stock/population structure, abundance, fishery bycatch, and assessment frequency and quality (Table 1). The remaining 15 subcategories of data were considered of secondary importance for most species in meeting the mandates of the MMPA and ESA.

Stock/population structure - Both the ESA and MMPA provide NOAA Fisheries with the authority to manage and protect marine mammals and turtles at taxonomic levels below species. The population (ESA) or stock (MMPA) level is the fundamental unit of legally mandated conservation efforts. In practice stock or population level determination is often problematic. Within the ESA context, NOAA Fisheries and USF&WS have developed guidelines for defining population structure as part of the

[1]For example, since the 1994 amendments to the MMPA, NOAA Fisheries' efforts have focused largely on collecting data to estimate minimum population size, determine fishery bycatch and to refine stock identification.

Table 1. Simplified data categories and levels for marine mammals and turtles as developed under the Protected Species Stock Assessment Improvement Plan

Category	Level	Level Description
Stock ID		
	0	No information (qualitative or otherwise) available
	1	Structure inferred from analyses undertaken for other purposes (e.g. distribution, differences in trends, differences in life history)
	2	Structure inferred from an analysis specifically aimed at investigating population differentiation (e.g., pollutants, stable isotopes, genetics, tagging)
	3	Structure inferred from an integrative analysis of at least two lines of evidence of the type listed under level 2
	4	Estimates of dispersal rate that include estimates of uncertainty
Abundance		
	0	No information (qualitative or otherwise) available
	1	Minimum estimate
	2	Imprecise and/or infrequent surveys
	3	Precise, frequent survey(s) with size/age composition
	4	Habitat and season specific surveys
Life History		
	0	No information (qualitative or otherwise) available
	1	Basic life history understood
	2	Some age/stage parameters available
	3	Age/stage parameters fully specified and variability determined
	4	Seasonal or spatial information (mixing, migration) available
Anthropogenic Impacts		
	0	No information (qualitative or otherwise) available
	1	Qualitative evidence (anthropogenic impacts)
	2	Minimum estimate (anthropogenic impacts)
	3	Unbiased estimates (anthropogenic impacts)
	4	Precise estimates, or no evidence of other human related mortality
Assessment Quality		
	0	None
	1	Assessment with minimum abundance/index only
	2	Assessment with simple deterministic models
	3	Assessment with advanced deterministic models
	4	Assessment with stochastic models
Assessment Frequency		
	0	Never
	1	Most recent ≥ 10 years
	2	Most recent 6-9 years
	3	Most recent 2-5 years
	4	Most recent ≤ 1 year

Evolutionary Significant Unit (56 FR 58612, 20 November 1991) and Distinct Vertebrate Population Segment (61 FR 4722, 7 February 1996) policy statements. The MMPA provides both biological and ecological guidance for making such determinations. Approaches to stock identification for marine mammals were clarified at workshops hosted by NOAA Fisheries (Barlow et al. 1995; Wade and Angliss 1997).

The following levels were used to define the quality of data available on species, population or stock structure (Table 1):

0 – No information (qualitative or otherwise) available

1 – Structure inferred from analyses undertaken for other purposes (e.g., distribution, differences in trends, differences in life history)

2 – Structure inferred from an analysis specifically aimed at investigating population differentiation (e.g., pollutants, stable isotopes, genetics, tagging)

3 – Structure inferred from an integrative analysis of at least two lines of evidence of the type listed under level 2

4 – Estimates of dispersal rate that include estimates of uncertainty

Abundance (numbers) - Abundance estimates are required under both the ESA and MMPA to evaluate the status of a species. Typically these estimates are meant to describe the status (or trend) of the population or at least that portion of the population observed in a specific area/time. The estimates can take various forms including, but not limited to, estimates of total abundance either corrected or uncorrected for individuals not seen or counted during the survey, estimates of the abundance of some known portion of the population (e.g., nesting females), index counts of that portion of the population observed at selected sites, and estimates based on mark and recapture (or sight/resight) techniques. The data used to derive these estimates are usually obtained from a sighting survey conducted from an aircraft, vessel, or point on land at one time of year. For most populations, the data from single surveys cannot be used to describe the year-round status of the population in a specific area. While such an approach is compatible with the requirements of ESA status reviews and MMPA stock assessments, it is inadequate to address other needs, such as fine-scale temporal or spatial estimates of species numbers or densities (that are frequently necessary for ESA Section 7 reviews).

The following levels were used here to define the status of data available on the abundance of a species, population or stock (Table 1):

0 – No information (qualitative or otherwise) available

1 – Minimum count, abundance estimate, or index count

2 – Unbiased estimate of abundance (CV =>30%)[2]

[2] A coefficient of variation (CV) of 30% or less is generally considered to be a desirable level of precision appropriate for making management decisions

3 – Unbiased estimate of abundance (CV < 30%) with seasonally OR geographically explicit density

4 – Seasonal and geographic specific density estimates

Anthropogenic impacts (numbers)- The third component of a status review or stock/population assessment is an estimate of anthropogenic mortality. For most protected species, incidental fishery bycatch is the greatest source of anthropogenic mortality. NOAA Fisheries is required to identify serious injuries and mortalities of protected species resulting from interactions with fishing gear. Fishery observer programs have been implemented in all of the NOAA Fisheries' regions to obtain this information. Specially trained observers are placed on a sample of fishing boats to observe and record data on protected species bycatch, and to document the characteristics of the gear, fishing practices, and landed catch. These data are then used to estimate the total protected species bycatch in a fishery.

The following levels were used to define the status of data available on the fishery bycatch mortality of a protected species population or stock (Table 1):

0 – No information (qualitative or otherwise) available

1 – Qualitative evidence of anthropogenic impacts

2 – Minimum estimate of anthropogenic impacts

3 – Unbiased estimate of anthropogenic impacts (CV =>30%)

4 – Precise estimate of anthropogenic impacts (CV < 30%) OR no evidence of human induced mortality

Assessments (frequency) - One of the major uses of the protected species data collected by NOAA Fisheries is to assess the status of each species under its mandates. An assessment involves comparing abundance and mortality to determine the current status of the species with respect to the biological reference points established under the MMPA or ESA. Under the 1994 amendments to the MMPA, there are four "reference points"–optimum sustainable population (OSP), depletion, potential biological removal (PBR) and the zero mortality rate goal (ZMRG). The reference points under the ESA are less well defined but involve quantitative criteria for listing the species as threatened or endangered, or for delisting.

The frequency of stock assessment reviews are dictated to a certain degree by statute. Under Section 117 of the MMPA, stock assessments shall be reviewed (although not necessarily revised) annually for strategic stocks and for stocks with significant new information. For all other stocks, assessments shall be reviewed at least once every third year. However, new abundance or mortality estimates are not necessarily available this frequently, and as a result the annual or triennial assessment reviews often lack new data on abundance or mortality precluding a new assessment of status. Section 4 of the ESA requires a review every five years of all listed species. Such a review does not always include a new assessment, again because of the lack of

current abundance or mortality data. As up-to-date assessments are a key element of the protected species stock assessment improvement plan, the following levels were used to define the recency of the assessment (Table 1):

0 – No assessment conducted

1 – Most recent assessment is ≥10 yrs old

2 – Most recent assessment is 6-9 yrs old

3 – Most recent assessment is 2-5 yrs old

4 – Assessment conducted in past year

Assessments (quality) - Improving the quality of protected species assessments was one of the key factors behind the development of this Plan. Most protected species are assessed using very simple models driven largely by default values. This practice has generated assessments which typically have a great deal of uncertainty, and have, therefore, led to a very precautionary approach to management. The approach advocated here is to improve the quality of the assessments by improving both data collection and model development. The following levels were used to define the quality of assessments (Table 1):

0 – No assessments conducted

1 – Assessment with minimum abundance or index only

2 – Assessment using simple deterministic models with defaults or proxies

3 – Assessment using more advanced deterministic models without defaults or proxies

4 – Assessment using species specific sophisticated models, such as stochastic models, depletion models, or projection models (e.g., PVA)

Life history (turtles only) - Turtle assessments typically follow a different methodological approach than marine mammals, and require considerable life history information. The following levels were used to define the quality of life history data available for use in population assessments (Table 1):

0 - No information

1 - Basic life history understood

2 - Some age/stage parameters available

3 - Age/stage parameters fully specified and variability determined

4 - Seasonal and/or spatial information available

C. Information Tiers

The general strategy for achieving successively higher levels of data collection and stock assessments involves a tiered approach. The tiers (Fig. 7) recognize the costs of mounting new survey efforts, the time required to implement significantly new efforts, the technical difficulties involved in implementing new methodologies, and the obstacles that must be overcome in assessing species which are difficult to survey.

Tier I – Improve Stock Assessments Using Existing Data Collection Resources

- No new assessment efforts but simply maintain the existing level of stock assessments
- Develop improved survey and analytic methods

The Tier I strategy is to continue the existing abundance survey efforts and make better use of available data and surveys. Because there has been an erosion of spending power over time, Tier I will require a significant infusion of funds to maintain the existing surveys and to add staff for analysis of the data collected in these surveys. This will maintain the quality of the existing assessments and will probably increase the quality of some assessments for some species and stocks. This tier can be achieved quickly (~ 3 years), given the infusion of appropriate funds.

Tier II – Elevate Stock Assessments to New National Standards of Excellence

- Meet the mandates of the ESA and MMPA by achieving Level 2 under Categories for abundance (numbers), assessment (frequency and quality), fishery mortality and stock ID for all stocks
- Upgrade assessments of core species stocks to Level 3 under Categories for abundance (numbers), life history, assessment (frequency and quality), anthropogenic impacts (fishery and other human), and stock ID. Achieve for other Categories, Levels 1-4 as appropriate

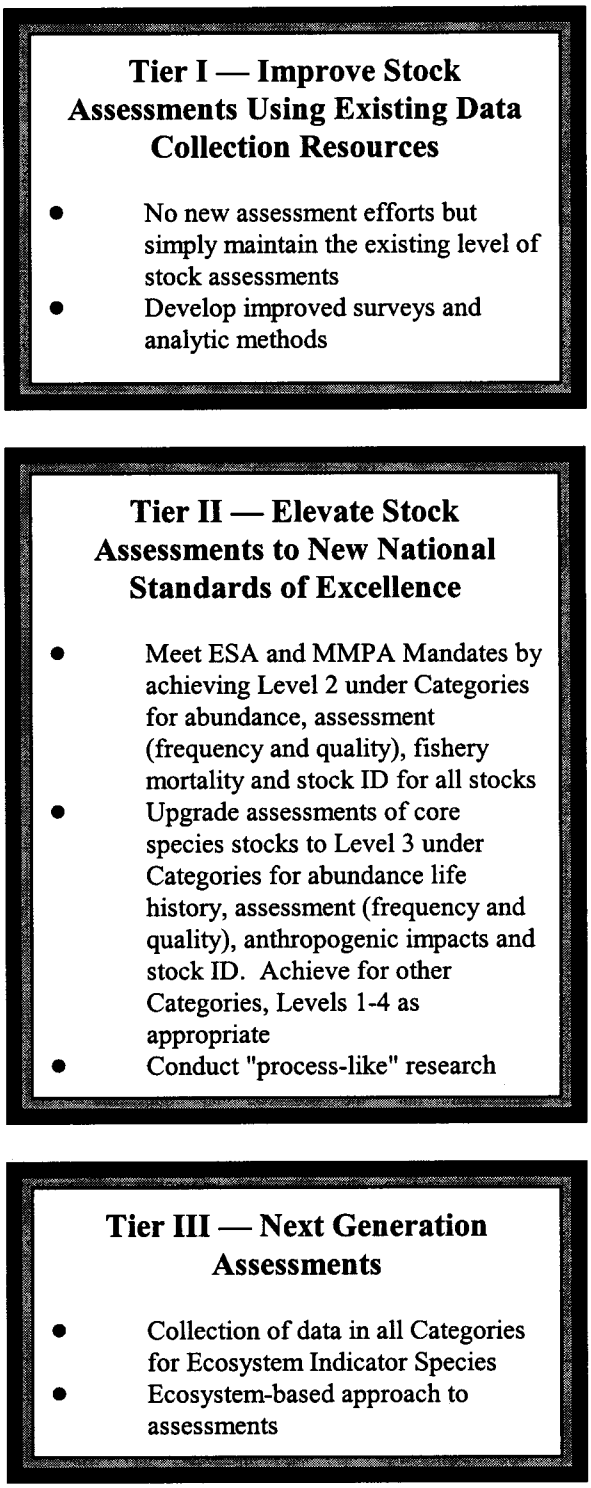

Figure 7. Summary of the key features of the three Tiers of Assessment Excellence

- Conduct "process-like" research to meet needs of constituents (e.g., achieve Level 2 or greater under Categories of Behavioral and Physiological Responses to Noise for Core Species)

The next step in this strategy (Tier II) is to improve the quality of data and assessments for all species and stocks so as to meet the mandates of the MMPA and ESA. Under Tier II, low quality or nonexistent assessments of numerous hard to assess species and stocks will be elevated to higher levels. This will require that sufficient data be collected and analyzed for all species and stocks for abundance estimates, stock identification, mortality estimates and assessments. For some core species[3], achieving this tier a much higher level of data resolution (such as information on seasonal and temporal abundance patterns) be provided to evaluate impacts of specific actions on core species of interest. Achieving these improvements will require considerable additional research

Achieving Tier II will involve significant new survey and fishery observer efforts in areas and times to properly assess species and stocks. Under Tier II, multiple surveys would be scheduled around individual species times of peak abundance. Tier II will also require a major effort focused on improving the quality of stock identification for marine mammal species. Most marine mammal species are currently managed as a single management stock in an oceanic basin, despite the existence of data for various species suggesting that multiple stocks exist. These improvements will require a significant investment in survey infrastructure (e.g., lab equipment, ships and aircraft). Data acquisition and analysis (particularly for the stock identification element) will also require a significant amount of time. However, with appropriate resources, it is likely Tier II can be achieved for virtually all species within a decade.

Tier III – Next Generation Assessments

- Collection of data in all Categories for Ecosystem Indicator Species to provide better understanding of how marine mammals and marine turtles function within their respective systems

- Ecosystem-based approach to assessments

The final stage in the strategy will involve moving assessments away from the traditional single-species approach towards an ecosystem-based approach. This will complement the current efforts underway for improvements in fishery stock assessments. For a few key species (i.e., "Ecosystem Indicator Species") this will involve the collection of a basic suite of data under all five data categories discussed previously. For all species, this will mean the stock assessment will be conducted with processes and models not previously used.

[3]Core species are defined here as species or stocks where higher precision and extra data are required to meet the needs of decision makers. These will include species listed under the ESA as Endangered and Threatened, as well as stocks listed as depleted under the MMPA.

D. Assessment of the Present Status of Protected Species Stock Assessments under the Matrix of Needs

Staff from each Science Center evaluated the current status of all protected species for which their Center has assessment responsibility.

Marine Mammals – A total of 165 marine mammal stocks was identified. Of these stocks, 134 are currently at Tier I while 31 have attained Tier II status (Table 2, Appendix Table 3). All stocks in the Pacific Islands region are currently in Tier I.

Forty-one of the 165 stocks were considered strategic in the 2002 Stock Assessment Reports; that is, these stocks were either listed under the ESA, listed as depleted under the MMPA, or had fishery takes greater than their Potential Biological Removal level. Six of the strategic stocks were at Tier II, while 25 of the nonstrategic stocks were at Tier II (Table 2).

Quality of the data available on each marine mammal stock provides insight into where improvements are needed (Tier I generally equates with data quality Levels 0-1, while Tier II equates to Levels 2-4.) Improvements are needed in all five data categories (stock identification, abundance, fishery mortality, and assessment frequency and quality; Table 3). There were many species or stocks for which no information was available on abundance or mortality. Beyond this, the greatest need for improvement is in stock identification (101 stocks [61%] were deficient in this category), although a significant level of improvement is required under the remaining four categories.

The quality of data varies by Region reflecting historical resource availability and data collection priorities. The Southwest Fisheries Science Center has historically focused much of its protected species resources and efforts on assessments, particularly on small cetaceans in the Eastern Tropical Pacific. As a result, data quality is more advanced under most categories for almost all of their stocks. Assessment work in the newly formed Pacific Islands Region has been chronically underfunded and the region has no marine mammal stocks classified as Tier II (Table 2).

Marine Turtles – All 13 marine turtle populations are at Tier I (Tables 4 and 5, Appendix Table 4) in terms of data quality. Major deficiencies exist in all data categories. Turtle abundance may be evaluated using either nesting beach counts of adult females and/or in-water estimates. Beach count estimates are generally quite good, while in-water estimates require further refinement. Both are likely necessary to properly estimate turtle abundance (the former is useful for estimating total abundance, while the latter is important in estimating spatial and temporal abundance patterns). Six of the 13 populations have high quality data for nesting beach counts (five do not nest in the US), but data quality if rudimentary for in-water estimates for all populations. Assessment quality also needs significant improvement across the board.

Table 2. Summary of status of marine mammal stocks using the Tier I and Tier II classification scheme described in the text.

	Strategic		Non-Strategic		Total		
Region	Tier I	Tier II	Tier I	Tier II	Tier I	Tier II	All
Alaska	6	4	18	3	24	7	31
Northeast	10	1	9	4	19	5	24
Pacific Islands	4	0	24	0	28	0	28
Southeast	8	1	25	1	33	2	35
Southwest	7	0	23	17	30	17	47
Total	35	6	99	25	134	31	165

Table 3. Data quality for marine mammal stocks. Tier I equates with Levels 0-1 data and Tier II equates to Levels 2-4.

	Stock ID		Abundance		Fishery Mortality		Assessment Frequency		Assessment Quality	
Region	Tier I	Tier II	Tier I	Tier II	Tier I	Tier II	Tier I	Tier II	Tier I	Tier II
Alaska	13	18	16	15	14	17	18	13	22	9
Northeast	12	12	9	15	3	21	1	23	6	18
Pacific Islands	27	1	28	0	27	1	28	0	27	1
Southeast	31	4	29	6	31	4	29	6	30	5
Southwest	18	29	7	40	6	41	1	46	0	47
Total	101	64	89	76	81	84	77	88	85	80

Table 4. Summary of status of marine turtle stocks using the Tier I and Tier II classification scheme described in the text.

	Endangered		Threatened			Total	
Region	Tier I	Tier II	Tier I	Tier II	Tier I	Tier II	All
Atlantic and Gulf of Mexico	5	0	2	0	6[a]	0	6
Southwest and Pacific Islands	4	0	4	0	7[b]	0	7
Total	9	0	6	0	13	0	13

[a] Green turtles in Atlantic listed as both Threatened and Endangered
[b] Olive ridley turtles in Pacific listed as both Threatened and Endangered

Table 5. Data quality for marine turtle stocks. Tier I equates with Levels 0-1 data and Tier II equates to Levels 2-4.

	Stock ID		Abundance[a]		Fishery Mortality		Assessment Frequency		Assessment Quality	
Region	Tier I	Tier II	Tier I	Tier II[b]	Tier I	Tier II	Tier I	Tier II	Tier I	Tier II
Atlantic and Gulf of Mexico	5	0	5	(5)	6	0	3	3	6	0
Southwest and Pacific Islands	7	0	3	(1)	7	0	0	7	7	0
Total	12	0	8	(6)	13	0	3	10	13	0

[a] 5 populations do not nest within the US, so nesting beach counts are not applicable
[b] Quality of nesting beach counts only

IV. Resource Requirements

A. National Summary

Senior protected species staff of the Science Centers were polled as to their current, Tier I and Tier II staffing and resource needs. Respondents were asked to identify staffing (government FTE, contract, and other) needs in four general areas–field programs, fishery observer programs, lab/office programs, and other. Various skill sets or jobs were identified under each program. Results of this response are summarized below (Table 6).

Current situation – All Science Centers presently have at least some staffing for marine mammal assessments, and all regions except for the NW and Alaska are also staffed for turtle assessments. A few Regional Office and Headquarters staff also engage in assessment work, notably in the conduct of fishery observer programs. In FY03, there were 146 NOAA Fisheries FTE involved in assessments (Table 6). This full time staff is supplemented by ca. 200 contract staff, most of whom are either survey or fishery observers.

The 142 individuals (25 FTE and 117 contract) working on observer programs generally represent observer staff involved only in protected species programs. NOAA staff typically design and coordinate these programs, while contract employees usually are the actual observers. Most regions also have observer programs which collect data on fishery catches, bycatch, and discards. In fisheries where the two programs are compatible for data collection, sampling issues may dictate that additional funding be available for protected species to ensure that appropriate sample sizes are obtained to generate precise, unbiased bycatch estimates. Note that levels of current observer coverage are typically a function of available functions, with deployments designed to maximize precision within a variety of constraints. However, coverage under Tiers I and II are typically designed to meet a desired level of precision (coefficient of variation <30% when possible). In virtually all cases, this results in a significantly greater number of trips observed (and increased FTE or sea-days) to meet the improved precision even if there is no change in the fisheries observed (Tier I).

An analogous situation exists for abundance surveys. Most observers are seasonal contractors, employed for 2-3 month periods (these have been converted to FTE by assuming each seasonal observer equaled 0.25 FTE). The number of survey observers increases between the current situation and Tier I, even without additional survey efforts, simply to allow for full staffing of surveys. For example, a ship board survey can be conducted with one observer team; however, by employing a second team, it is possible to correct for observer error or for animals missed by the first team.

Table 6. National protected species staffing requirements. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	17.0	3.0		10.5	1.5		17.5	2.0	
Abundance Survey Observers	5.0	28.6		2.5	19.5		7.0	31.3	
Biopsy, Mark/recapture, and Tagging Studies	9.1	3.7	1.5	7.3	9.3		13.0	9.5	
Field collection of biological data	14.6	8.7		6.0	10.3		1.0	5.3	
Processing of Biological Samples	7.7	9.7		5.3	5.0		4.5	4.0	
Fishery Observer Programs									
Fishery Observers		113.0			149.0		1.0	176.0	
Other Observer Staff	24.8	4.0		32.0	14.0		5.8	2.0	
Bycatch Analyses	3.5	0.3		2.5	1.0		5.0	2.0	
Processing of Biological Samples	1.1	0.3		1.3	1.0		4.5	0.0	
Lab/Office Programs									
Stock Identification	7.7	6.5	0.3	9.3	4.0		6.0	5.0	1.0
Analysis of Biological Data	20.1	11.4	3.8	11.3	3.8	2.0	9.0	5.3	2.0
Conduct Assessments	10.6	0.5		9.5	0.5	0.0	11.5	1.3	
Assessment Research	2.7	0.8	0.5	8.5	2.8	1.0	8.5	8.3	1.0
Communication of Results[1]	11.3	3.9		11.0	2.5		7.5	2.8	
Other (list by name)									
All Series	10.4	2.5		9.8	3.0		10.0	4.0	
Total	145.5	196.8	6.0	126.7	227.1	3.0	111.8	258.5	4.0

[1] Includes 1 FTE for F/PR2

Aircraft, vessels and, in some cases, small boats are the key physical resources required to accomplish protected species stock assessments. In FY03, 2094 flight hours (539 flight days) and 765 sea days are used nationally (Table 7). The mix of aircraft and vessels varies significantly among regions. Most offshore, cetacean surveys are conducted using a high-winged, twin engine aircraft, such a DeHavilland Twin Otter or a Rockwell Aero Commander. NOAA's Marine and Aviation Operations (NMAO) office is typically the vendor for NOAA Fishery's Twin Otter aircraft; one of the two existing otters is used full time while the second is shared with other NOAA Line Offices. Needs also exist for aircraft not available through NMAO (e.g., helicopters and single engine aircraft), and these needs are currently met through charters.

Table 7. Protected species vessel and aircraft requirements by FMC

		Current (FY03)		Tier I		Tier II	
FMC	Taxa	Vessel	Aircraft	Vessel	Aircraft	Vessel	Aircraft
AFSC	Mammals	200d	209d 1254h		33d 200h	195d	47d 280h
NEFSC	Mammals & Turtles	75d	255d 600h	90d	90d 200h	45d	45d 100h
NWFSC	Mammals	0d	0d/0h	0d	0d/0h	90d	30d 180h
PIFSC	Mammals	50d	0d/0h	75d	0d/0h	75d	na 40h
	Turtles	50d	0d/0h	30d	70d 350h	60d	100d 300h
SEFSC	Mammals	120d	45d 120h	120d	0d/0h	120d	0d/0h
SWFSC	Mammals	240d	0d/0h	0d	0d/0h	60d	0d/0h
	Turtles	30d	30d 120h	30d	30d 120h	60d	0d/0h
National	Total	765d	539d 2094h	345d	223d 870h	705d	222d 900h

Ship time (765 sea days) required for protected species surveys is provided in part by NMAO and in part by charter. Preference is typically given to NOAA vessels if these are available and are suitable for the planned field work. However, the specialized needs of many protected studies (e.g., shallow draft for inshore surveys or two observing platforms) have led to chartering either UNOLS or commercial vessels.

Additional personnel and resources will be needed to achieve the two Tiers of excellence proposed under this plan:

Tier I - This tier involves no new surveys or observer programs, but makes better use of existing programs and data. This level of effort maintains (or restores) the status quo but will improve assessments for some species in all regions through better use of existing programs and data. Meeting Tier I needs will require an increase of 357 individuals (127 FTE, 227 contract, 3 others), essentially doubling the FY03 protected species assessment staffing (Table 6). Much of this increase stems from a marked increase in existing fishery observer programs to meet desired levels of precision for assessing protected species mortality.

Smaller increases are desired in assessment areas.

Even without adding additional surveys, an additional 345 sea days and 870 flight hours (223 days) are necessary to simply maintain the current level of assessments (Table 7). This is a because of the significant erosion of research spending power that has occurred over the past decade. For example, at the NEFSC less than half of the $450K transferred in the late 1990s to the Center for abundance surveys is presently available for vessel and aircraft charter. As a result, fewer sea days or flight hours are available for the surveys, which has led to abbreviated surveys and reduced precision in the abundance estimates.

Tier II – Moving to Tier II will involve new surveys and observer programs and will significantly increase staffing (Table 6), with an additional 112 FTE, 259 contract employees, and 4 others needed. Expansion of observer programs to adequately sample all fisheries with protected species interactions will constitute a significant part of this increase (7 FTE and 178 contract employees).

Because Tier II involves an increase in survey effort (e.g., seasonal rather than annual surveys), a large increase in platform time is required. An additional 705 sea days and 900 flight hours (~222 days) are needed (Table 7). Many of these days and hours will be on vessels or aircraft which would have to be provided by charter rather than through NMAO because the needed days would exceed the availability of survey platforms.

A result of this increased effort at Tier II will be that NOAA Fisheries will fully achieve the mandated information requirements of both the ESA and MMPA.

B. Region-Specific Needs to Achieve Tiers I and II

1. Alaska Fisheries Science Center

Marine mammal stock assessments in the Alaska Region involve a partnership between the Alaska Fisheries Science Center's (AFSC) National Marine Mammal Laboratory (NMML), the Center's Resource Ecology and Fisheries Management Division (REFM), and the Protected Species Division of the Alaska Region (AKR). NMML conducts research on distribution, abundance, trends in abundance, causes of the trends, and prepares stock assessments. REFM provides information on bycatch of marine mammals in federally-regulated fisheries. The AKR administers the Alaska Marine Mammal Observer Program (AMMOP), which provides information on bycatch of marine mammals incidental to Alaska's state commercial fisheries.

Current situation – The NMML currently has a staff of 50 FTE and 11 contractors involved with the assessment of marine mammals in Alaska and in the California current ecosystem (Table 8). The AKR has one FTE dedicated to the administration of the Alaska Marine Mammal Observer Program.

The majority of the efforts at the NMML are directed towards marine mammal stocks in Alaskan waters. The 4 FTE and 1 contractor in the California current ecosystem program work closely with staff from the Northwest Center and Region to provide information

Table 8. AFSC - NMML and AKR/Marine Mammal Observer Program protected species staffing requirements. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	8.8			0.5			2.0		
Abundance Survey Observers	3.3	1.0					1.0	7.0	
Biopsy, Mark/recapture, and Tagging Studies	5.3	2.0	0.5	1.0	1.0		2.0	2.0	
Field collection of biological data	6.3	1.5						1.5	
Processing of Biological Samples	2.0	1.0			0.5			1.0	
Fishery Observer Programs									
Fishery Observers					40.0			106.0	
Other Observer Staff	1.0							1.0	
Bycatch Analyses	1.0				1.0		2.0	1.0	
Processing of Biological Samples				0.3			2.5		
Lab/Office Programs									
Stock Identification	1.0		0.3		1.0		2.0	1.0	
Analysis of Biological Data	8.5	3.5	0.8	0.8	1.0			2.5	
Conduct Assessments	2.3	0.3		1.0			3.0	0.5	
Assessment Research	0.8	0.3	0.5	0.5		1.0	1.5	0.5	1.0
Communication of Results	5.1			2.0			2.0		
Other (list by name)									
Data management		1.5		2.3			1.0		
Administration	4.0								
Gear maintenance	1.0								
Computer programming								1.0	
Total	50.4	11.1	2.1	8.4	44.5	1.0	19.0	125.0	1.0

or assessment of stocks in Washington, Oregon, and California.

NMML staff are solely responsible for the assessment of 21 cetacean stocks and 10 seal stocks that occur in Alaska waters. Of these stocks, two cetacean stocks and five seal stocks are presently assessed at Tier II level; all other stocks are at Tier I. In addition, NMML staff work with the Southwest Fisheries Science Center to assess seven cetacean stocks and five pinniped stocks that occur in WA/OR/CA waters. Of these stocks, there are two cetacean stocks and 4

pinniped stocks at Tier II; all other stocks and populations are at Tier I.

Improving stock assessments of Alaska marine mammals currently in Tier I will require significant efforts in three major areas: stock identification, abundance, and fishery-related mortality. Of 27 marine mammal stocks in Alaska, abundance is at Levels 0 or 1 for 16 stocks. As is typical in all regions, a very few stocks are comparatively well studied (e.g., Steller sea lions, harbor seals, bowhead whales, Cook Inlet beluga whales), while there are major gaps in our knowledge about most stocks.

Research activities routinely conducted by NMML include aerial surveys to assess harbor seal and Steller sea lion abundance, which are conducted every year and rotated between areas in Alaska. Every 5 years, three years of aerial surveys are flown to assess the abundance of small cetaceans in Alaska. NMML researchers and their associates are pursuing ways to augment and improve marine mammal assessment methods in Alaska. Foe example, passive acoustics recorders have been deployed over the past 3-5 years to monitor the seasonal distribution of large cetaceans, such as North Pacific right whales and blue whales, in the Gulf of Alaska and Bering Sea.

The RACE division of the AFSC collects information on marine mammal bycatch incidental to federally-regulated fisheries. Information provided by the RACE division currently meets most of the needs of NMML's marine mammal assessment program for the federally-regulated fisheries. In addition to the federally-regulated fisheries, there are several Alaska state fisheries with a moderate level of marine mammal take that have not been observed for more than 10 years, or have never been observed. Observer coverage of 1-2 Alaska state-managed fisheries per year (~5% observer coverage) is provided through the AKR's Alaska Marine Mammal Observer Program (AMMOP). In 2002, the AMMOP completed the first year of a two-year effort to observe the Kodiak set gillnet fishery. However, the AMMOP was unable to deploy observers during FY03 due to a severe funding shortfall. It is expected that adequate funding will be available in 2004 to complete the Kodiak program but funding beyond 2004 is not expected to be available.

Tier I – Under Tier I, the AFSC would seek to accomplish the following objectives:

- A restoration of aerial survey effort needed to assess the abundance of 4 species of ice seals for which no estimate of abundance is available (Level 0)

- Improvements in data management and analysis efficiency to improve the timeliness of producing assessments and of communicating research results to managers and the public

- Addition of certain research equipment (e.g., "bigeye" binoculars, biopsy guns, replace passive acoustic recorders) which would optimize the quality and quantity of data currently collected during vessel surveys

- A restoration of fishery observer coverage to levels available in 2002, which would allow the AMMOP to rotate a 2-year observer program with 5% coverage to high-priority Alaska fisheries.

Accomplishing the first two objectives will require additional staff to analyze and manage data in hand and results from ongoing research. Additional seasonal field assistants will also be necessary. Adding new equipment or replacing some equipment, which is no longer available, will increase our ability to improve assessments.

Accomplishing the fourth objective will require the addition of 40 contracted fishery observers and the equipment, vessels, etc. needed to support the program. This level of effort will ensure that at least two Alaska state fisheries a year with moderate levels of marine mammal bycatch could be observed, and that each fishery with a moderate level of marine mammal bycatch would be observed within the next six years. Adding two additional FTEs to this program will also enable core program activities (i.e., database management and observer debriefing) to be conducted by NOAA Fisheries staff in lieu of contractors.

Tier II – To achieve the requirements of Tier II, the AFSC will need to accomplish the following objectives:

- Greatly expand vessel and aerial survey effort to collect information on the distribution and abundance of large cetaceans throughout the North Pacific and Bering Sea.
- Increase equipment available for remote sensing (e.g., satellite transmitters, towed acoustic arrays, passive acoustic recorders, ARGOS time).
- Implement directed biopsy studies and expand genetic analysis capability to identify stock structure of the remaining unstudied stocks.
- Expand observer coverage to ensure annual baseline monitoring of all fisheries in Alaska with moderate or high levels of marine mammal bycatch.

To attain Tier II for large cetacean stocks, substantial ship time and aerial survey time would be necessary in order to survey the full ranges of a variety of species. In addition, remote sensing techniques, such as installation of passive acoustic recorders and use of satellite tags combined with increased ARGOS satellite time, will provide the information on seasonal distribution needed to provide managers with the information necessary to avoid conflicts with human activities. Targeted stock structure studies and genetics analyses would be implemented. In addition to additional platform costs, staff will be needed to collect samples and process/analyze the data. Over several years, the additional surveys and analytical staff should result in all stocks being raised to Tier II.

To attain Tier II for all stocks, three or more fisheries would have observed each year. Observer gear needs and other physical support such as skiff and R/V charters would need to be increased proportionally as coverage increases.

With acquisition of Tier II staffing and resources, all stocks should be moved to Tier II or higher within approximately 6 years.

2. Northeast Fisheries Science Center

Marine mammal and turtle assessment activities at the NEFSC are split between two administrative units: the Protected Species Branch (PSB) within the Center's Resource Evaluation and Assessment Division, and the Fisheries Sampling Branch (FSB) within the Fisheries and Ecosystems Monitoring and Analysis Division. The FSB runs the fisheries observer program responsible for collection of data on protected species bycatch in selected fisheries. The PSB conducts abundance surveys, estimates total bycatch in commercial fisheries, and prepares the actual assessments.

Current situation – The NEFSC currently has a staff of 18 FTE and eighteen contractors involved with the assessment of marine mammals and turtles in Northwest Atlantic Ocean waters (Tables 9-10). The bulk of these staff are involved with marine mammals; 4 FTE and 4 contractors were involved with turtle activities in FY03 (Table 10). Approximately 497 sea days were devoted in FY03 to protected species observations.

Table 9. NEFSC protected species staffing requirements for mammals. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	2.5						2.0		
Abundance Survey Observers		5.3			2.0			1.5	
Biopsy, Mark/recapture, and Tagging Studies	1.0			0.5	0.8		0.5		
Field collection of biological data	1.0								
Processing of Biological Samples				0.5			1.0		
Fishery Observer Programs									
Fishery Observers		6.0			6.0			40.0	
Other Observer Staff	0.5			1.0			4.0		
Bycatch Analyses	1.0			1.0					
Processing of Biological Samples									
Lab/Office Programs									
Stock Identification				2.0					1.0
Analysis of Biological Data	1.0	3.0	1.0	1.0		2.0	1.0		2.0
Conduct Assessments	2.5			1.0			1.0		
Assessment Research	1.0			1.0					
Communication of Results	1.0			1.0					
Other (list by name)									
Administration	2.0			1.0					
Passive Acoustics							1.0		
Economist	1.0								
GIS Analyst							0.5		
Total	14.5	14.3	1.0	10.0	8.8	2.0	11.0	41.5	3.0

Table 10. NEFSC protected species staffing requirements for turtles. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	0.3								
Abundance Survey Observers								0.8	
Biopsy, Mark/recapture, and Tagging Studies	0.3				1.0			0.5	
Field collection of biological data									
Processing of Biological Samples									
Fishery Observer Programs									
Fishery Observers		4.0			2.0			4.0	
Other Observer Staff	0.3						0.8		
Bycatch Analyses	1.0							1.0	
Processing of Biological Samples									
Lab/Office Programs									
Stock Identification									
Analysis of Biological Data	0.5		1.0				1.0		
Conduct Assessments	0.3								
Assessment Research									
Communication of Results									
Other (list by name)									
GIS analyst							0.5		
Gear Research	1.0								
Total	3.5	4.0	1.0	0.0	3.0	0.0	2.3	6.3	0.0

NEFSC staff are involved with the assessment of 20 cetacean stocks, four seal stocks, and four turtle populations. Five cetacean stocks and two seal stocks are presently assessed at Tier II level; all the remaining mammal stocks and turtle populations are at Tier I. The greatest impediment to improvement of stock assessments is the lack of data on stock structure; of 24 marine mammal stocks, stock structure for 12 is rudimentary (Levels 0 or 1). However, the lack of adequate abundance data is also an issue; of 24 marine mammal stocks, five have no abundance estimate (Level 0) and 4 more have only a single point estimate (Level 1). Of the four populations of marine turtles found in NE waters, all have inadequate (Level 1) estimates of in-water abundance. A few stocks are well studied (right and humpback whales, harbor porpoises, harbor seals), while most stocks (especially turtles and some pelagic delphinids) have major gaps in knowledge.

Protected species survey activities conducted by the NEFSC include seasonal (6-9

months) aerial surveys for North Atlantic right whales, spring and summer vessel surveys for large cetaceans in the Gulf of Maine, and triennial surveys of harbor seal abundance from MA to ME. The Center is also attempting to maintain a triennial survey series for coastal cetaceans, and offshore cetaceans, partly as a cooperative effort with the SEFSC. However, recent funding limitations have impeded these surveys, such that the survey frequency is approaching once every 5-6 years. Surveys of pelagic turtle abundance are conducted as part of the cetacean surveys, however, it would be useful to focus surveys in the triennial year on turtles alone. The NEFSC and the Northeast Regional Office of NOAA Fisheries have reinitiated a research project in Long Island Sound to provide a long term, in-water index site for marine turtles.

NEFSC scientists and their associates continue to work on improved assessment methods in the NE. Considerable field work is being conducted on the use of passive acoustics, both with towed arrays during cetacean surveys and using pop-ups to monitor the absence/presence of right and humpback whales in New England waters. Staff are exploring alternative assessment techniques (e.g., using multiple survey aircraft as a way of avoiding use of ships) and have initiated a cooperative project with the Woods Hole Oceanographic Institute to assess sperm and pilot whale dive times to improve the quality of assessments (g[0] correction).

The FSB is in the process of developing a comprehensive bycatch sampling program for most Federally managed fisheries in Northeast waters. Traditionally, this program was supported by protected species funds and directed towards sampling commercial sink and drift gillnet fisheries (~5% coverage) with limited trawl coverage (<< 1% coverage). Reflecting a change in funding and priorities, coverage in the last two years has shifted to significantly increase bottom trawl and scallop dredge coverage (~5% coverage for most elements), while decreasing coverage on gillnet fisheries in New England. Overall, there is more coverage for protected species issues than in the past but holes remain in the coverage (e.g., pot gear). In addition, coverage is dependent on continued provision of groundfish funds by Congress.

Tier I – Under Tier I, the NEFSC would seek to accomplish:

- Reduction in the number of stocks with unknown stock structure by analyzing tissue samples currently in hand or collected as part of existing surveys
- Restoration of fishery observer coverage to levels available prior to 2001
- Maintenance of the triennial survey coverage for cetaceans and turtles

This will require additional staff at the NEFSC, as well as support of two additional FTE at the SEFSC's genetics lab housed in NOAA's Charleston Lab. This effort, by itself could move seven stocks into Tier II.

Restoration of 576 observer sea days (436 for mammals and 140 for turtle) would return observer coverage of New England and Mid-Atlantic gillnet fisheries to levels

that would guarantee appropriate spatial and temporal coverage for gillnet takes of marine mammals and turtles. While this would not likely move any new stocks to Tier II, it would keep several stocks from falling from Tier II to Tier I.

Finally, 6 of the 7 Tier II marine mammal stocks are in danger of reverting to Tier I unless the triennial abundance survey can be maintained. This will require support of an additional 6 seasonal employees (equivalent to two FTE) for surveys, and funds to support a 90 d charter on an appropriate vessel. Additional staff will also be needed to manage, analyze and process the data, particularly the acoustic data.

Tier II – To achieve the requirements of Tier II, the NEFSC will need to:

- Conduct seasonal abundance surveys
- Implement directed biopsy studies to identify stock structure of the remaining unstudied stocks
- Expand observer coverage to ensure baseline monitoring of all fisheries with protected species bycatch

Abundance surveys need to be expanded to include a rotating spring and fall survey to assess the abundance of species whose abundance is greatest in the Northeast outside of the summer months (e.g., fin and sei whales). One survey would be a traditional line transect survey, while the second would be a focused photo-id survey. A companion to these surveys would be an expansion of past stock structure studies, much of which will focus on either genetic sampling or photo-id. In addition to additional platform costs, staff will be needed to collect samples and process and analyze the data. Over the next 10 years, the combination of surveys and stock structure studies should move all stocks to Tier II.

Finally, protected species observer coverage will have to be increased to ensure that all fisheries and gears of concern have a permanent level of coverage. This would move the remaining Tier I species to Tier II, and ensure that no stocks revert to Tier I.

3. Northwest Fisheries Science Center

Marine mammal research occurs mainly in two groups at the Northwest Fisheries Science Center (NWFSC): the Environmental Conservation Division (ECD) and the Marine Mammal Program in the Office of the Science Director (MMP). There is also support on some projects from the Conservation Biology Division (genetics and risk assessment) and the Fishery Resource Analysis and Monitoring Division (fishery observer data).

Current Situation – The NWFSC currently has staff of 4.5 FTEs shared between the ECD and MMP (Table 11). ECD staff are involved in analyses of contaminant levels and effects of contaminants on marine mammals. These researchers are also conducting research on stable isotopes and fatty acids to understand prey of marine mammals. This group focuses on NW marine mammals but is also involved with research projects with other Science Centers.

Table 11. NWFSC protected species staffing requirements for mammals. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders									
Abundance Survey Observers							2.0	3.0	
Biopsy, Mark/recapture, and Tagging Studies	0.5				1.0				
Field collection of biological data	0.5			3.0	1.5				
Processing of Biological Samples				1.0			1.0		
Fishery Observer Programs									
Fishery Observers									
Other Observer Staff									
Bycatch Analyses									
Processing of Biological Samples					1.0				
Lab/Office Programs									
Stock Identification	0.5			1.0				1.0	
Analysis of Biological Data	3.0		1.0	2.0					
Conduct Assessments									
Assessment Research									
Communication of Results				1.0			1.0		
Other (list by name)									
GIS analyst				1.0					
Data Management				1.0			1.0		
Acoustics Technician				1.0	1.0				
Risk Assessment Biologist							1.0		
Total	4.5	0.0	1.0	11.0	4.5	0.0	6.0	4.0	0.0

The MMP has two FTEs and the current research focuses on Southern Resident killer whales. In FY03, over 20 research projects were initiated. The areas of research include annual photo-identification of all whales, acoustic characterization of the killer whale environment, behavior of whales in response to vessels, identification of prey species and abundance, winter distribution of whales, global taxonomy of killer whales, and habitat use.

Tier I – Under Tier 1, the NWFSC would:

- improve information on abundance and trends and life history

- improve information on habitat use
- improve methods for tagging, biopsy and analyses
- improve information on stock structure

To accomplish these improvements will require 16 additional staff (11 FTE and 5 contractors) to be deployed in areas of biopsy, tagging and analyses, data management, acoustics, GIS analyses, and field data collection. Chemical analytical methods for determining prey of marine mammal species using fatty acid analyses, stable isotopes would be further developed. This work would move three species to Tier II.

The NWFSC has not been allocated NOAA ship days for marine mammal research. Therefore, ship time is urgently needed. There is also a pressing need for a small boat to collect biological samples and conduct photo identification work in the Puget Sound area.

Tier II – The focus of the NWFSC Marine Mammal Program will be to move all species to Tier II. Under Tier II, the NWFSC will:

- improve information on Threats - Human related Non-lethal effects or stressors
- assess impacts of threats
- improve information on habitat use
- improve life history information, including prey resources
- determine levels of persistent contaminants in marine mammal species
- compare contaminant levels geographically and temporally in marine mammals
- examine impacts of contaminants on life history parameters

Abundance and habitat use studies would be expanded to include spring and autumn aerial survey work. Staff (six FTE) and contractors (four) will be needed to collect and perform analyses of the data. Risk assessments would be conducted to improve assessments of key species.

With additional staff and resources, the key marine mammal species would reach Tier II or higher in anthropogenic impacts, abundance, habitat use and food habits.

4. Pacific Islands Fisheries Science Center

Marine mammal and turtle assessments at the PIFSC are conducted in the Protected Species Division (PSD), which is subdivided into the Marine Mammal Research Program (MMRP) and the Marine Turtle Research Program (MTRP). Fisheries observer programs are managed by the Pacific Island Region (PIR), and are, therefore, not included in this report.

Current situation – The MMRP almost exclusively conducts research on one marine mammal, the endangered Hawaiian monk seal.

There are currently four FTE and nine contractors working seasonally or full time on Hawaiian monk seal assessment (Table 12). Most of these staff work on population monitoring efforts in remote field camps at the six main subpopulations of Hawaiian monk seals in the Northwestern Hawaiian Islands (NWHI). Primarily non-field staff include federal and contract data analysts, database managers, IT support and field logistics staff.

Table 12. PIFSC protected species staffing requirements for mammals. The numbers ofadditional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	1.0	2.5		5.0	1.0		8.0	1.0	
Abundance Survey Observers		3.0			3.0			3.0	
Biopsy, Mark/recapture, and Tagging Studies									
Field collection of biological data		0.2		0.3					
Processing of Biological Samples									
Fishery Observer Programs									
Fishery Observers									
Other Observer Staff									
Bycatch Analyses									
Processing of Biological Samples									
Lab/Office Programs									
Stock Identification				1.0	1.0		1.0	1.0	
Analysis of Biological Data	1.0	0.3		1.0	0.3		2.0	0.3	
Conduct Assessments	2.0	0.3		2.0	0.3		2.0	0.3	
Assessment Research		0.5		1.0	0.5		2.0	5.5	
Communication of Results		2.0		1.0	2.0			2.0	
Other (list by name)									
Cetacean Team Leader				1.0			1.0		
Total	4.0	8.7	0.0	12.3	8.0	0.0	16.0	13.0	0.0

Deploying, maintaining and retrieving the camps, which last from 3 to 6 months per year, involves complex logistics. At most of the research camps, all supplies and equipment must be deployed and retrieved each year. This includes all food, water, tents, medical supplies, communications equipment, small boats, engines, solar power systems, generators, fuel, and scientific equipment. Transportation to most sites is restricted to seagoing vessels, and transit time from Honolulu is 2-7 days. Landing strips for chartered aircraft are available at two sites.

Detailed demographic information has been compiled on Hawaiian monk seals in the NWHI, and this unique long-term time series is dependent upon the continuation of field camps. Conservation strategies are greatly enhanced by the detailed information available for each subpopulation. Currently, only one full time field camp survey leader is on staff, the remaining survey leaders and most field assistants are recruited through a contractor on an annual basis, so that year-to-year continuity in staff is sub-optimal.

Systems for processing raw field data into detailed summaries of population abundance and trend, age and sex structure, and vital parameters in a matter of a few months have been developed so that data for decision making are available in a timely manner. In addition, up-to-date demographic data are annually incorporated into a stochastic simulation model, which allows for exploration of various management scenarios. Further efforts to optimize field effort, obtain precise and unbiased total abundance estimates, and elucidate life history parameters of monk seals are underway.

Historically, the SWFSC has had the lead in all cetacean assessment work conducted in the EEZ around the Hawaiian Archipelago, but the formation of the Pacific Islands Region (PIR), the apparent need for cetacean stock assessments in the entire PIR, and the growing concern over possible fishery-cetacean interactions require cetacean scientific expertise within this newly formed region. In addition to the EEZ around the Hawaiian Archipelago, a core group of cetacean experts from PIFSC will begin to work collaboratively with SWFSC experts to assess cetacean populations in the EEZ around American Samoa, Guam, Northern Mariana Islands, Johnston Atoll, Palmyra Atoll, Jarvis Island, Howland and Baker Islands, and Wake Island. Although these islands are very small, the EEZ waters surrounding them (including Hawaii) encompass nearly 1.5 million square miles, an area nearly equal to all other US EEZ waters combined.

MTRP current situation – The Marine Turtle Research Program conducts research on Hawaiian and other Pacific island Threatened and Endangered sea turtle populations. Currently, 4 FTE and 9 contractors work seasonally, part-time or full-time on Pacific sea turtle biology, ecology, life history, assessment and related areas of investigation (Table 13). In addition, the regional office's observer program employees another 15 FTE and 40+ contractors to observer fisheries (notably the Hawaiian longline fishery).

Annual assessment tasks include basic biological and ecological investigations; fishery interaction data collection; pelagic and post-nesting satellite tracking; collection

Table 13. PIFSC protected species staffing requirements for turtles. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders				0.5	0.5		0.5	1.0	
Abundance Survey Observers	0.3	0.3		0.5	0.5		1.0	1.0	
Biopsy, Mark/recapture, and Tagging Studies	0.3	0.3		0.5	0.5		0.5	1.0	
Field collection of biological data	0.5	0.3		1.0	0.5		1.0	1.0	
Processing of Biological Samples	0.3	0.3		0.5	0.5		0.5	1.0	
Fishery Observer Programs									
Fishery Observers		40.0			100.0				
Other Observer Staff	15.0			30.0					
Bycatch Analyses		0.3							
Processing of Biological Samples		0.3			0.5				
Lab/Office Programs									
Stock Identification									
Analysis of Biological Data	0.3	0.3		0.5	0.5		1.0	0.5	
Conduct Assessments				0.5	0.3		0.5	0.5	
Assessment Research	0.3			0.5	0.3		1.0	0.3	
Communication of Results	0.3				0.3		0.5	0.5	
Other (list by name)									
Total	17.0	41.8	0.0	34.5	104.3	0.0	6.5	6.8	0.0

of field data on growth rates, abundance, survival, and movements for computer simulation modeling; and long-term monitoring for population trends. Five species of Pacific sea turtles are included in this work: green, loggerhead, leatherback, olive ridley, and hawksbill turtles. Substantial close collaboration takes place with an array of researchers both within and outside of NOAA Fisheries.

The green turtle population endemic to Hawaii has been the principal focus of investigations to date. Other populations of green turtles, including other sea turtle species throughout the U.S. Pacific islands and affiliates, have been far less studied to date due to serious personnel, funding, and various logistical constraints. The immediate geographical areas in need of attention include American Samoa, Guam, Commonwealth of Northern Mariana

Islands, Palau, Federated States of Micronesia, Republic of the Marshall Islands, and various other remote islands such as Wake, Johnston Atoll, Palmyra, Kingman Reef, Howland, Baker and Jarvis. Sea turtles are known to occur at all these locations and, like Hawaii, often have prominent roles in aspects of the indigenous human cultures. However, no stock assessments have been conducted and basic biological studies are only in their early stages. All of the islands and species mentioned are designated for priority research in the U.S. Pacific Sea Turtle Recovery Plans finalized in 1998 by NOAA Fisheries and the USF&WS.

Tier I – Under Tier I, the PIFSC will:

- Conduct a thorough assessment of stock ID through use of genetic analysis
- Improve continuity in field staffing and data processing
- Develop a team of expert cetacean ecologists to conduct mandated stock assessment research throughout the Pacific Islands Region

To meet Tier I standards, the number of federal full time survey leaders involved with the Hawaiian monk seal research program would need to be substantially increased. This has been recommended by the Hawaiian Monk Seal Recovery Team and by nearly every external review of the monk seal research program.

PIFSC must also acquire a staff of cetacean experts to begin to build a core group of researchers with cetacean expertise in the PIR. At a minimum, this will involve a cetacean task leader, a field biologist, and a data analyst to complement the ongoing efforts by the SWFSC to assess cetacean stocks and fishery interactions this region.

Tier II – To achieve standards of Tier II, the PIFSC will need to:

- Extend assessment activities to the Main Hawaiian Islands (MHI)
- Extend assessment activities to Necker and Nihoa Islands, NWHI
- Optimize field effort in the NWHI
- Collaborate with SWFSC in cetacean surveys in the U.S. EEZ in waters of American Samoa, Wake, Guam, Northern Marianas, Johnston Atoll, Jarvis, Howard Baker Is. and the Hawaiian Archipelago. Annual three month surveys will be conducted on a rational basis at each location assuring regular and complete coverage

While most Hawaiian monk seals reside in the NWHI, a small population appears to be increasing in number and expanding its distribution in the Main Hawaiian Islands (MHI, including Niihau, Kauai, Oahu, Molokai, Kahoolawe, Maui and Hawaii), where they were relatively rarely encountered prior to the mid-1990's. This trend represents perhaps the best opportunity for significant progress in recovery for the species, but also involves enormous challenges related to interactions with humans and domestic and feral animals on land, vessel collision, fishery interactions, oil spills and disease transmission. Currently, assessment efforts in the MHI are

conducted irregularly by staff primarily assigned to other duties. To achieve Tier II status, at least two full time survey leaders stationed on Kauai and Maui are required, as well asa one full time assessment scientist to coordinate data collection, analyze data, and report results.

Two additional small populations in the NWHI, at Necker and Nihoa Islands, exist but are rarely visited due to difficulty of landing and camping on the islands. Further, while they are regularly used by seals and pups are born at the islands annually, limited vessel support and other finite resources have dictated an emphasis on the six primary subpopulations in the NWHI. To accurately assess the total stock, regular monitoring of these sites is need and will require additional sea days on a well-equipped, preferably NOAA, research vessel.

Finally, little is known about cetacean stocks occurring within the Hawaiian EEZ and almost nothing is known about these stocks in the other EEZs within the PIR. A field biologist and data analyst are needed to augment the proposed work that will be initiated by the SWFSC (separate SAIP) in American Samoa, Guam, Northern Mariana Islands, Johnston Atoll, Palmyra Atoll, Jarvis Island, Howland and Baker Islands, and Wake Island. Efforts by these staff members will facilitate the collection and analysis of cetacean information obtained during dedicated surveys and from fishery observers and contractors.

Tiers I and II for MTRP – Tier II standards have only been approached for the Hawaiian green turtle population. However, maintaining this level of excellence in coming years is problematic given the limited current personnel levels and program support. Expansion of research and monitoring efforts to conduct sea turtle assessments of the other Pacific islands, as required under the newly formed PIFSC, will diminish the scope and quality of work in Hawaii, and will be inadequate overall, if additional staffing and support are not provided. Table 13 summarizes these needs to achieve Tier I and Tier II status. This would require an additional 35 FTE and 104 contractors for Tier I and seven more FTE and seven more contractors for Tier II.

5. Southeast Fisheries Science Center

Marine mammal and turtle assessment activities at the SEFSC are distributed between two administrative units: the Protected Species and Biodiversity Branch (PS&BDB), and the Sustainable Fisheries Branch (SFB). The PS&BDB conducts abundance surveys, estimates total bycatch in commercial fisheries, and prepares population assessments. The SFB runs the fisheries observer program responsible for collection of fishery dependent data on protected species bycatch in selected fisheries.

Current situation – The PS&BDB and SFB programs together currently have a staff of 33.9 FTEs and 77 contractors located at five laboratories in the Southeast Region involved with the assessment of marine mammals and turtles in Southwest Atlantic Ocean, Gulf of Mexico, and northern Caribbean waters (Table 14-15).

PS&BDB staff are involved with the assessment of 35 cetacean stocks, and 5 sea

turtle populations in the geographical Southeast Region. Only the coastal Western North Atlantic bottlenose dolphin is assessed at Tier II; all other cetacean stocks are assessed at Tier I. The greatest impediment to improvement of stock assessments is the lack of data on stock structure: of 35 cetacean stocks, stock structure for 31 stocks are at Level 1, and 4 stocks are at level 2. The lack of adequate abundance data is also an issue: of 35 cetacean stocks, 11 have no abundance estimate (Level 0), 18 have only a single point estimate (Level 1), 5 have an unbiased estimate of abundance (Level 2) , and only one has an unbiased abundance estimate with geographically explicit density estimates (Level 3). Only coastal Western North Atlantic bottlenose dolphins are well studied; most stocks have major gaps in the knowledge of their status.

Table 14. SEFSC protected species staffing requirements for mammals. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	0.8			2.0			2.0		
Abundance Survey Observers	1.5	13.4		2.0	12.0		2.0	12.0	
Biopsy, Mark/recapture, and Tagging Studies	1.0	1.4		4.0	2.0		4.0	3.0	
Field collection of biological data	2.1	1.4			2.0			2.0	
Processing of Biological Samples	1.2	0.7			2.0			2.0	
Fishery Observer Programs									
Fishery Observers		24.0					1.0	20.0	
Other Observer Staff	6.0	1.0							
Bycatch Analyses	0.2			1.0			2.0		
Processing of Biological Samples	0.1			1.0			2.0		
Lab/Office Programs									
Stock Identification	1.4	3.5		2.0			2.0		
Analysis of Biological Data	0.8	3.9		2.0	2.0		2.0	2.0	
Conduct Assessments	1.1			3.0			2.0		
Assessment Research	0.2			1.0	2.0		1.0	2.0	
Communication of Results	3.8	0.9		1.0			2.0		
Other (list by name)									
Data Management	0.2	1.0		1.0	2.0		1.0	3.0	
Total	20.2	51.0	0.0	20.0	24.0	0.0	23.0	46.0	0.0

Table 15. SEFSC protected species staffing requirements for turtles. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	2.0	0.5		1.5			3.0		
Abundance Survey Observers		1.2			2.0		1.0		
Biopsy, Mark/recapture, and Tagging Studies	0.1	0.1	1.0	1.0	3.0		6.0	3.0	
Field collection of biological data		0.1			2.0				
Processing of Biological Samples		0.8			2.0				
Fishery Observer Programs									
Fishery Observers		20.0							
Other Observer Staff	5.3	2.0		3.0			4.0	2.0	
Bycatch Analyses	1.4	0.3			1.0		2.0		
Processing of Biological Samples		0.1			1.0			2.0	
Lab/Office Programs									
Stock Identification				1.0	2.0			2.0	
Analysis of Biological Data	1.7	1.0		2.0	2.0				
Conduct Assessments	0.6					3.0	1.0		
Assessment Research	0.8			1.0	2.0		3.0		
Communication of Results	0.7								
Other (list by name)									
Data management support	1.0			1.0			1.0		
Program administration	0.2			1.0			1.0		
Total	13.7	26.0	1.0	11.5	17.0	3.0	22.0	9.0	0.0

Survey activities conducted by the PS&BDB include:

- Seasonal (2-3 month) aerial surveys for mid-Atlantic bottlenose dolphins
- Seasonal winter aerial surveys of North Atlantic right whales
- February-March and July-August vessel surveys for large and small cetaceans in the southeast Western North Atlantic, Gulf of Mexico, and northern Caribbean, on a rotational schedule.

The PS&BDB is also attempting to maintain a triennial survey series for coastal cetaceans and offshore cetaceans in coordination with the NEFSC. However, recent funding limitations have impeded these surveys, such that the survey frequency is

approaching once every 5-6 years, rather than once every 3-yrs, and prevents obtaining statistically meaningful estimates of population trends in these areas. Biopsy samples for genetic-based population research are obtained during all vessel surveys, and from dedicated stock-ID research on coastal bottlenose dolphins in the mid-Atlantic.

PS&BDB scientists and their associates continue to work on improved abundance estimation and assessment methods for cetaceans in the Southeast. Beginning in 2000 the PS&BDB developed and implemented passive acoustic methods to collect acoustic data with towed hydrophone arrays, sonobuoys, and bottom mounted acoustic recording devices to complement and compare with visual survey data, thereby expanding the scope of vessel surveys to include survey effort during nighttime and limited periods of poor visibility. The acoustic data also serve as the basis for developing correction factors for cetacean detection functions obtained during visual surveys (e.g., g(0) bias correction).

The PS&BDB program at the NOS Beaufort Laboratory focuses on stock structure, causes of mortality, and life history of the depleted Western North Atlantic coastal bottlenose dolphin, and other species with sympatric or parapatric distributions or those for which strandings represent a significant means of obtaining data for assessments (e.g., *Kogia sp.*). Stock identification of Western North Atlantic bottlenose dolphins is investigated via a multi-disciplinary program involving population genetics, stable isotope ratios, telemetry, and photo-identification to define multiple biologically based management units within the "coastal population". Information is opportunistically collected on humpback and right whales and spotted dolphins. Interactions between bottlenose dolphins and mid-Atlantic fisheries are monitored through a stranding response program, and when possible cause of death is determined (i.e., fishery interaction or other cause). Supplemental information is provided to the NEC's observer program by means of real-time (weekly) data on the number of boats fishing, the species being landed, and the gear types in use. The program at Beaufort includes an age estimation lab for marine mammals, primarily delphinids and phocoenids, from which vital rates and life history parameters are estimated.

The SEFSC marine mammal molecular genetic program at the NOAA Lafayette, LA, laboratory conducts stock identification research for the Northeast and Southeast Regions. This responsibility encompasses 21 small cetacean and 4 pinniped stocks in the NE Region and 28 small cetacean stocks in the SE region. Of the 53 stocks, 43 (81%) have stock structure information at Levels 0 or 1 (27 in the Southeast), including 12 stocks listed as Strategic. Currently the SEFSC bio-molecular genetics program employs 1 FTE and 3 contractors to address genetic stock identification research for the NE and SE Regions. However, at this staffing level only a few stocks can be studied. Staff are involved in other genetic work, including genetic species identifications of samples in cases where decomposition is too great to identify a carcass, or where several species are too similar to allow accurate identification using external characters. This work supports both stranding networks and bycatch estimation, particularly for species which are difficult to identify, such as the beaked whales. The genetics program staff is also working to improve stock structure analyses by developing and incorporating new and/or improved laboratory techniques aimed at

increased accuracy and speed of sample processing and improved methods of analysis for examining stock structure.

The SFB is in the process of developing a comprehensive bycatch sampling program for most Federally managed fisheries in Southeast waters. Traditionally, this program was partially supported by protected species funds and was directed towards sampling commercial pelagic and bottom long-line and shark gillnet fisheries (~3-5% coverage). Coverage in recent years has increased to around 8% for the longline fisheries. Regardless of available observer effort, lack of enforcement of observer requirements and unsafe vessels prevent many observers from boarding fishing vessels and obtaining the needed data on protected species (and fisheries) bycatch. Increased effort (sufficient observers to achieve 8-10% coverage) and improved compliance from fishers will improve information on protected species bycatch.

Tier I – Under Tier I, the SEFSC would seek to accomplish:

- A reduction in the number of stocks with unknown stock structure by analyzing tissue samples currently in hand and/or collected as part of existing surveys

- An improvement of fishery observer coverage to levels that yield 8-10% coverage, as appropriate

- A maintenance of the triennial survey coverage for cetaceans

The lack of an increase in funding for mid-Atlantic bottlenose dolphin stock identification research and interactions with fisheries has diminished the field and analysis effort and delayed the attainment of the goal of defining stock structure and conducting real-time monitoring of the fisheries interactions for this population. In addition, initial funding for the cetacean aging lab was superceded by the dolphin stock ID and mortality monitoring efforts and has not been restored, and as a result development of life history information for PBR calculations and vital rates assessments for bottlenose dolphin and other cetacean species have been delayed.

Under Tier I, the SEFSC Bio-Molecular Genetics program would seek to reduce the number of stocks with stock ID at levels 0 and 1 using existing samples and collection resources. The number of species for which this is possible is relatively small because sufficient samples for genetic analyses of stock structure are available only for a handful of these species. Currently, base funds support only 2 of the 4 staff. To maintain status quo, funding will be required for support of the other two staff members. Additionally, staff for dedicated biopsy field work (4 people - shooter, boat navigator, data collector and photographer) are needed to complete ongoing stock structure studies in the Southeast and would be critical for bringing several Gulf of Mexico stocks to Tier II. A biometrician with experience in genetic analyses is needed to improve analytical methods. A database technician is required to properly archive current and future. This effort, by itself could move 5-10 stocks into Tier II.

Increased observer effort to achieve 8-10% coverage in specific Southeast fisheries with known interactions with cetaceans would greatly improve bycatch estimates, and facilitate the moving some affected stocks to Tier II (e.g., Western North Atlantic offshore

bottlenose dolphin, Atlantic spotted dolphin). Without an increase in the frequency of abundance surveys to cover all three southeast regions, it will not be possible to move any Tier I stocks to Tier II. Increased survey frequency will provide sufficient information to provide updates for outdated abundance estimates. This will require the addition of 2 FTE survey leaders, 2 FTE observers, and 12 observers to staff and analyze data from expanded cruise schedules (Table 14). Additional staff and resources will also be needed to collect, manage, analyze and process the data, particularly the acoustic data gathered in parallel with the visual survey data.

Tier II – In order to achieve the requirements of Tier II, the SEFSC will need to:

- Conduct seasonal abundance surveys for year-round coverage
- Implement directed biopsy studies to identify stock structure of the remaining unstudied stocks
- Expand observer coverage to ensure baseline monitoring of all fisheries with protected species bycatch

An increase in the number and frequency of abundance surveys in all three Southeast regions will be necessary to move Tier I stocks to Tier II. Increased survey effort will allow statistically confident detection of population trends over time and cover all seasons to detect and analyze seasonal shifts in abundance and distribution. Abundance surveys will be expanded to include a rotating spring, summer, fall and winter surveys to assess the abundance of species whose abundance is currently only known from limited summer surveys. The survey schedule would include 4 seasonal surveys that rotate between the Mid-Atlantic, Gulf of Mexico and Northern Caribbean areas to provide complete seasonal coverage. These surveys would employ integrated visual and passive acoustic survey methodologies, and analyses that incorporate correction factors for g(0) and other known biases. A companion effort to these surveys would be an expansion of biopsy collections for genetic analyses of stock structure. Dedicated biopsy sampling programs will target specific populations/species for which insufficient genetic information is available. In addition to a doubling of platform costs (4 instead of 2 vessel surveys/yr), additional staff will be needed to collect samples and process/analyze the data. Over 10 yrs, the combination of increased survey effort and stock structure studies should move all stocks to Level 2 for stock structure and abundance.

Dolphins found in the extensive bays, sounds and estuaries in the Southeast have been little studied. Limited telemetry data have shown that individuals or even stocks of dolphins do not strictly reside in estuaries or on the coast but to some extent move between these environments. Accurate estimates of abundance, the extent of isolation, residency, and between-habitat movement are required to assess these populations from the mid-Atlantic to the Gulf of Mexico, and will require expanding genetic, telemetric, mark-recapture studies, vessel and aircraft surveys, and research.

To meet Tier II needs, genetic stock structure of the remaining Northeast and Southeast Region cetacean stocks is needed.

To accomplish this, additional staff are needed to collect sufficient biopsy samples from each stock for this determination to be made. At a minimum, a second boat crew of four people (shooter, boat navigator, data collector and photographer) is needed to work inshore and shallow water stocks in the Southeast. Collection of biopsy samples from more pelagic stocks in the Atlantic and Gulf of Mexico will require a variety of large-vessel cruises dedicated to biopsy sampling. These cruises must be dedicated to biopsy sampling rather than have biopsy effort as an add on to other efforts and must use vessels conducive to successful biopsying, or sufficient sampling will not be achieved. Furthermore, seasonal variation in stock structure must be addressed, requiring multiple cruises per year. Additional laboratory staff (3) will be needed to process and analyze the samples for Southeast stocks. Similar staff additions and cruises are required for NE stocks, including small vessel work to collect pinniped samples (see section on NEFSC). Improved resources for data collection, including a DNA sequencer with higher throughput capabilities and a multi-well fluorometer are necessary for more timely analysis of samples.

Finally, it is proposed that protected species observer coverage in those fisheries with known interactions will be increased to ensure that all fisheries of concern have a permanent and statistically meaningful level of coverage. This should move Tier I stocks to Tier II, and ensure that some stocks do not regress to Tier I. With acquisition of Tier II staffing and resources, all stocks should be moved to Tier II or higher.

6. Southwest Fisheries Science Center

Marine mammal and turtle assessment activities at the SWFSC are conducted within the Protected Resources Division (PRD). The PRD is responsible for conducting abundance surveys, estimating fishery mortality, and assessing the status of 7 pinniped stocks, 30 west-coast cetacean stocks, and 10 eastern tropical Pacific dolphin stocks. The SWFSC has traditionally assessed the status of 19 Hawaiian Island cetacean stocks, and 6 turtle species, but some or all of these will eventually become the responsibility of the newly formed PIFSC.

Current Situation – The PRD conducts abundance surveys, estimates total bycatch in commercial fisheries, and prepares stock assessments. In addition to conducting assessments and assessment research, the PRD produces the molecular stock identification used for the stock assessments. Activities within the molecular stock identification program include scientists directing studies, analyzing data, preparing reports and papers, and biological and molecular technicians who archive, prepare, and analyze biological specimens. Stock identification analyses are conducted on core species from the eastern tropical Pacific, the Hawaiian EEZ, the U.S. west coast and selected species from Alaska (Steller sea lions, killer whales, harbor seals, and beluga whales). We also provide scientific advice to the Pacific Offshore Cetacean Take Reduction Team, which has been working to reduce bycatch in the drift gillnet fishery to below PBR levels.

The PRD currently has a staff of 26 FTE and ~20 contractor FTE involved with the assessment of marine mammals and turtles in the Pacific Ocean (Tables 16-17). The Southwest Regional Office fields the observer program and includes another 2 FTE and 22 contractors.

Of the cetaceans occurring in the U.S. EEZ, 3 cetacean stocks are at Tier II and all others are at Tier I. All the pinniped stocks are currently at Tier II, except for one at Tier I.

Of the dolphin stocks in the eastern tropical Pacific that the PRD assesses, all are at Tier II, except for two at Tier I. All turtle species are at Tier I.

Table 16. SWFSC protected species staffing requirements for mammals. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	1.0			1.0					
Abundance Survey Observers		3.0						1.5	
Biopsy, Mark/recapture, and Tagging Studies									
Field collection of biological data	3.5	5.3		1.5	4.3			0.8	
Processing of Biological Samples	3.5	7.0		2.0			2.0		
Fishery Observer Programs									
Fishery Observers		19.0			1.0			6.0	
Other Observer Staff	2.0	3.0		1.0	14.0		1.0	1.0	
Bycatch Analyses									
Processing of Biological Samples									
Lab/Office Programs									
Stock Identification	4.0	2.0		2.0					
Analysis of Biological Data	4.0	0.5		3.5			2.0		
Conduct Assessments	2.5			2.0			2.0		
Assessment Research	0.5			4.0			2.0		
Communication of Results	1.0	1.0		2.0					
Other (list by name)									
Total	22.0	40.8	0.0	19.0	19.3	0.0	9.0	9.3	0.0

Table17. SWFSC protected species staffing requirements for turtles. The numbers of additional staff needed to collect the types of information to maintain status quo (Tier I) and to meet NOAA's legislative mandates (Tier II), respectively, are provided.

	Current (FY03)			Tier I			Tier II		
Staff Activity	FTE	Contract	Other	FTE	Contract	Other	FTE	Contract	Other
Field Programs									
Survey Leaders	0.8								
Abundance Survey Observers		1.5						1.5	
Biopsy, Mark/recapture, and Tagging Studies	0.8			0.3					
Field collection of biological data	0.8			0.3					
Processing of Biological Samples	0.8			1.3					
Fishery Observer Programs									
Fishery Observers									
Other Observer Staff									
Bycatch Analyses	0.3			0.5			1.0		
Processing of Biological Samples	1.0								
Lab/Office Programs									
Stock Identification	0.8	1.0		0.3			1.0		
Analysis of Biological Data	1.0			0.5					
Conduct Assessments							1.0		
Assessment Research				0.5					
Communication of Results									
Other (list by name)									
Data Management				0.5			1.0		
GIS technician							1.0		
Total	6.1	2.5	0.0	4.0	0.0	0.0	5.0	1.5	0.0

We are currently planning summer/fall surveys of the US west coast once every 6 years and the Hawaii EEZ once every 6 years (120 sea days for each survey). In the past funding has been sufficient for this level of survey effort; however, funding comes from discretionary funds in national programs and the available discretionary funds may not be sufficient to fund the next survey (2005). Pinniped stocks are less expensive to survey, and we have been averaging 2-year survey intervals for northern elephant seals and 1-yr survey intervals for California sea lions (the latter funded with money for salmonid/fishery interaction studies). With funding from the U.S. Navy, we have been developing capabilities to conduct passive acoustic surveys of delphinids. Surveys of the eastern tropical Pacific will be conducted twice, every three years (240 sea days for each survey) for the core species and for the coastal species, but these surveys are

contingent upon annual renewal of funding for this research.

The Marine Turtle Research Program (MTRP) within the Protected Species Division has been working to increase scientific knowledge about threatened and endangered sea turtle stocks in the eastern Pacific Ocean as well as greater Pacific Ocean basin. At present, MTRP investigations focus primarily on Pacific leatherbacks, Eastern Pacific loggerheads, and East Pacific green turtles, although other stocks such as Pacific olive ridleys and hawksbills are also targeted. In all cases, the U.S. Pacific Sea Turtle Recovery Plans serve as templates to help develop research and conservation priorities. The MTRP uses a variety of technologies including genetic analysis, stable isotope analysis, and biotelemetry to answer questions about stock structure, in-water ecology, and migration. In response to the dramatic decline of the Pacific leatherback, recovery of this population is considered highest priority; MTRP actions have been multidimensional, including nesting beach conservation, in-water research, and socioeconomic analysis.

In addition to direct research, we work closely with fishers and observers groups in a number of Pacific rim countries such as Papua, Papua New Guinea, Guatemala, Mexico, Peru, Chile, and Galapagos Islands-Ecuador to work toward fisheries bycatch mitigation. This networking will not only assist in enhancing the research capabilities of in-country biologists, but will also lead to MTRP acquiring additional genetic and stable isotope samples for stock identification. Moreover, in response to the growing concerns about incidental bycatch of sea turtles in artisanal longline, drift-net, and set-net fisheries, the MTRP provides training to concerned onboard and dockside observers in these countries. Information exchange focuses on de-hooking, resuscitation, tissue sample collection, and data recording.

Tier I – Under Tier I, the SWFSC would seek to accomplish:

- Augment lost funding to maintain a 6-year survey interval for Hawaiian cetacean and U.S. West Coast cetaceans
- Analyze the backlog of acoustic data collected 1998-2002 in order to estimate g(0) for sperm whales and delphinids
- Conduct spatially explicit analyses of past survey data to estimate density and abundance on a finer spatial scale
- Salvage data from pre-1991 surveys and convert to a common format (data rescue).
- Improve data accessibility by conversion to GIS format.
- Develop new analytical methods focused on model selection and parameter estimation
- Reduce the number of stocks with unknown stock structure
- Continue to expand and improve the SWFSC tissue archive and database
- Develop an integrated molecular laboratory information management system
- Standardize data rescue formats from past molecular genetics and demographic studies and link existing

databases into a relational database system

- Continue to improve our understanding of variability among populations

- Develop and test molecular tools to assess reproductive condition from biopsy samples to estimate demographic parameters

- Fully fund data processing work for existing ecosystem field studies. The PRD has been conducting ecosystem studies concurrent with marine mammal assessment cruises for almost 20 years. We now view these studies as obligatory. For example, our recent Report to Congress on Results of IDCPA Research included a section on how ecosystem changes may affect abundance of depleted dolphin stocks; without this section, a major hypothesis would have gone unaddressed. Because this research is a part of every assessment cruise conducted by PRD, we place this item in the Tier I category.

Bullet 1 above would require a permanent survey coordinator (in addition to the seasonal observers and sea days currently used by the PRD). Bullets 2-5 would require an additional 6 FTEs (an acoustic analyst, a line-transect analyst, an assessment research position, a data technician position, a statistician and a GIS expert). Bullets 6-13 would require 10 FTEs (2 biological technicians, an analytical population geneticist, a cetacean molecular systematist, a demographer, and a cell biologist and 2 photogrammetrists, a communications position, and an ecosystem studies technician).

With the above funding, we could expect sperm whales and some of the delphinids and sea turtles to move from Tier I to Tier II.

Tier II – Under Tier II, the PRD would seek to accomplish:

- Increase the number of sea days per cetacean survey from 120 to 240 days and decrease the survey intervals from 6 years to 5 years for both U.S. West Coast and Hawaii EEZ

- Initiate cetacean surveys in the U.S. EEZ waters of the Western Pacific (American Samoa, Wake, Guam, Northern Marianas, Johnston Atol, Jarvis, Howard, and Baker Islands). Survey effort would be 120 sea days each year, rotating among island chains

- Conduct winter/spring aerial surveys along the US West Coast and winter/spring ship surveys in the Hawaiian EEZ to determine seasonality of cetacean distribution

- Initiate sound playback studies to determine the behavioral and physiological responses to noise

- Establish a national position for an archivist to develop storage procedures and standards so that specimens held at various Science Centers will be maintained in a consistent and safe manner

- Establish a national position to develop a web-based distribution database of the specimen archive

Bullet 1 would require 10 seasonal employees and 120 additional sea days on a

NOAA research vessel (twice, every 5 years). Bullet 2 would require 6 seasonal employees, 120 additional sea days on a NOAA research vessel every year, and one FTE (a line-transect expert). Bullet 3 would require 6 seasonal employees and one FTE (a line-transect expert). Bullet 4 would require one FTE (an acoustic expert) plus 30 sea days for directed studies and additional funds to buy acoustic playback equipment and to fund field studies. Bullets 5-6 would require two FTEs (national positions consisting of one archivist and one computer programmer).

With Tier II staffing and resources, all stocks should be moved to Tier II or higher.

C. General Resource Issues

1. Staffing (NOAA Fisheries employees and contractors)

Staff necessary to achieve the Tiers of Excellence include both NOAA Fisheries employees and contractors. Much of the increase in labor support can reasonably be met by contractors, particularly where the duty is seasonal or relatively short term (e.g., fishery or survey observers). However, new long-term staff needs must be met with new NOAA Fisheries FTEs. At the present, new NOAA Fisheries billets are extremely limited, but the data presented in Table 6 indicate that a least a doubling of FTE will be needed to achieve Tiers I and II. This increase greatly exceeds the current FTE ceilings, but represents an important investment in the long term future of NOAA Fisheries.

2. Education and Training

Improved training for NOAA Fisheries scientists is a significant issue within the agency. New NOAA initiatives for safety training in small boats and aerial surveys have emerged during FY03-04. Similarly, staff training and professional competency were issues identified the development of the Protected Species Requirements Plan. Additional training is clearly needed in:

- Science (e.g., increased competency in survey and statistical methods, GIS and genetic techniques, etc),
- Management/regulation (e.g, training in NEPA, ESA, etc), and
- Skills (e.g, small boat handling and safety, aerial survey safety, wilderness safety)

In 2002, NOAA Fisheries protected species stock assessment scientists were surveyed to identify "What types of additional training/professional development opportunities would best help you meet present or future assessment challenges?". Respondents were asked to rank 10 types of training from 1-4:

1: would greatly enhance the ability to produce accurate, precise and timely assessments

2: would help enhance the ability to produce accurate, precise, and timely assessments

3: may marginally improve the accuracy, precision, or timeliness of assessments

4: would not help or is irrelevant to these species

The results of the survey, sorted by average rank, are provided in Figure 6. The highest priority desire was for special interest workshops to exchange information on specific stock assessment techniques. This could be a complement to the National Stock Assessment Workshop held for NOAA fisheries assessment scientists. Special interest workshops were presumeably ranked highly because of the efficiency of learning cutting-edge stock assessment techniques in a small, collaborative atmosphere. The survey also did not ask for good topics for workshops, but topics might include: programs MARK and DISTANCE training and conservation genetics.

Funds for additional travel to conferences and assistance with advanced course work received the lowest ranks. The low rank for advanced course work may be due to the fact that most of the respondents were senior staff (most already with MS or PhD degrees) and would likely not need or be interested in pursuing advanced course work.

3. Vessels and Aircraft

The availability of suitable platforms currently limits the number and quality of abundance surveys. Protected species surveys frequently compete with fishery surveys for scarce time on NOAA vessels, and there is often insufficient ship time available. As a result, protected species programs regularly contract for vessel time, which adds significantly to survey cost. Contract costs for a 40m+ vessel (the minimum for at-sea surveys) are usually $4,000/sea day or greater, with larger vessels (e.g., UNOLS research ships) running more than $10,000 per day. This problem is compounded by the difficulty of finding ships with appropriate characteristics for sighting surveys (e.g., many sighting surveys now require separate locations for multiple sets of observers, all of which have to have an unobstructed view of the water at a minimum height above the water). Other operations (e.g., seal or dolphin captures) require relatively shallow draft vessels of medium endurance with the capability to launch and/or support skiffs. Most NOAA vessels do not meet these needs, and while the next generation of vessels will provide good survey platforms, their large size will not allow them to be used in near shore areas. Without investment in additional smaller, medium endurance vessels, NOAA's Protected Species ship needs will continue to require charter vessels.

The aircraft needed to support protected species operations also must meet a diverse set of mission requirements. The recent acquisition of a third Twin Otter by NOAA's NMAO is a valuable asset to NOAA's survey operations. However, all three Twin Otters are already booked to almost 100% capacity. The expected increase in survey operations to meet protected species needs will require NMAO to acquire additional aircraft (and staff) to keep pace with survey requirements. However, NMAO may not be able to meet all of these needs due to requirements for multiple aircraft to be simultaneously available in the same general location (e.g., harbor seal surveys in SE Alaska require 3

or more aircraft at the same time for a synoptic survey of the entire region). These needs will probably continue to be met through charters. However, use of non governmental aircraft carries the additional burden of ensuring that charter aircraft meet NOAA's safety standards. NOAA aircraft are maintained at a higher standard (comparable to FAA Part 135 which is the air carrier standard for common carriage operations) than most charter aircraft, which are maintained at FAA Part 91 (the general operating rules for aircraft). The increased inspection and training requirements inherent in Part 135 generally produces safer survey operations. NMAO is currently developing a revised NOAA Administrative Order that will address improved aircraft and pilot safety along the lines of the Part 135 Standard. The impact on surveys operations will be improved survey safety, but also increased cost.

4. Software

Data collected during surveys and analyses of these data rely upon a wide variety of software products. Some of these are "off-the-shelf," like DISTANCE, MARK, and Oracle, but others continue to be developed. A national investment in the development of a standard protected species assessment toolbox (such as exists for fisheries stock assessments) could significantly improve the quality and transparency of the protected species assessment efforts. Such a toolbox could include software designed to facilitate collection of visual sighting data during a survey, collection and processing of passive acoustic data (whether from towed arrays or pop-up buoys), analysis of telemetry data, integration of acoustic and visual sighting data, and so on. Presently, each Center proceeds independently with software development, so a centralized national program would save funds and enhance the quality and utility of the software.

5. Equipment

There are four relatively expensive sets of equipment needed by some or all of the Centers:

- Small boats - minimum of $35-40K per vessel with engine(s) and trailer
- Telemetry equipment - including satellite platform transmitters ($2.5-4K each) and associated processing costs
- Passive acoustic receivers and associated equipment - either towed arrays ($20K+) or pop-up buoys ($5-10K each)
- Genetic analytic equipment (sequencers, etc) - very expensive but limited to the 2-3 Centers that support the genetic needs of the other Centers

Each Center has varying needs and priorities.

6. Facilities

At present, most of the protected resource groups are space limited at their respective Centers (as are the Centers in general). As such, additional space will be necessary at all the Centers to house additional personnel. Some of this can be met through distribution of new staff to field laboratories such as the AFSC's Kodiak and Juneau (Auke Bay) laboratories.

V. Implementation Strategies

A. Implementation and Time Frames

The development of this plan comes at an opportune time because of the simultaneous implementation of NOAA Fisheries' Planning, Programming, Budgeting and Execution System (PPBES). PPBES provides the vehicle to feed the information developed in this report into the FY06-FY10 budget cycles for NOAA. More specifically, the information developed here supports the Protected Resources components of the Ecosystem Research Matrix Program (ERMP). Within this program NOAA Fisheries is tasked with identifying the Program's 100% Requirement. The 100% Requirement is intended to include all resources that would be required to implement 100% of our mandated research activities for all programs including protected species (marine mammals, marine turtles, salmon, and other listed species). For marine mammals and turtles, the assumption is that the 100% requirement is equivalent to achieving Tier II for all species and stocks.

Within the ERMP, protected species research is a component of at least two programs:

- Ecosystem Observation System
- Ecosystem Research

In addition, results from these programs provide direct support to the Protected Species Management Program.

The first program (EOSP) crosswalks directly to resource needs identified under the Field Based Programs, Fishery Observer Programs, and Lab/Office Programs elements of this plan. The second program (ERP) potentially relates to technology development under all three programs.

Note that this plan only provides estimates on current and anticipated routine operational activities at each Science Center, and not large special programs. For example, the NEFSC's North Atlantic right whale program, SWFSC Eastern Tropical Pacific tuna-dolphin population monitoring program and the AFSC Steller sea lion program are additional programs funded directly by Congress that will be added to the 100% Requirement. This may also be true for an acoustical component to the ocean observing system, and marine mammal acoustical research.

This plan and the associated ERMP elements focus only upon research. The PPBES also includes a separate element for Protected Species Management (PSM). Elements of the Protected Species ERMP support the PSM they are separate. Consequently, the 100% Requirement developed for PSM represents additional funding beyond that included here (or in the Protected Species ERMP).

Funding under the ERMP's 100% Requirement should by 2010, be sufficient to provide the resources necessary to implement this Plan. However, the time to achieve Tier II for all stocks and species will lag behind due in part to the difficulty of fully implementing the necessary field sampling programs. That is, to adequately determine stock identification for all cetacean species, a large number of individuals (> 50 at a minimum) will need to be biopsied from ships or small boats, and

the biopsy samples will then need to be analyzed by NOAA Fisheries' geneticists. To obtain the requisite sample sizes, dedicated cruises will be needed to simply obtain the genetic samples. Many of these cruises could sample multiple species, but in some cases, differences in seasonal distribution would require multiple cruises in an area over several years. As a result, even with full funding available by 2010, it will take at least another 5-10 years before most species will be moved to Tier II.

B. Funding - NOAA Fisheries and Its Partners

NOAA has traditionally funded most of its research. However, even with implementation of the 100% ERMP there is still a potential for significant cooperation between NOAA and its Federal partners. This could occur at three levels. First, support of NOAA funding initiatives by partners such as the US Navy, DOI's Minerals Management Service, and the Marine Mammal Commission would likely increase the success of funding initiatives in Congress. Secondly, cooperative research programs between NOAA and research units such as the U.S. Navy's Office of Naval Research (ONR) or the National Science Foundation would greatly increase the spending power of NOAA funding. Currently, ONR and NOAA cooperatively fund a number of research projects, particularly with respect to marine acoustics. Finally, NOAA can continue to seek funding for its research from external sources, although these sources generally fund specific initiatives rather than generic programs.

C. Future Development of This Plan

Completion of this Plan does not signal the end of the process of improving NOAA Fisheries stock assessments. A number of significant issues remain. The most important may be that *Tier III - Next Generation Assessments* remains to be defined and assessed. Here, an international workshop should be convened to identify the future of protected species assessments. This workshop could be held jointly with NOAA fishery assessment scientists.

An important next step will be the extension of the planning process to protected species other than mammal and turtles, and the development of a complementary requirements plan for Protected Species Management. Discussions on these issues are underway.

Finally, the data supporting this document require regular updating. In particular, the status of knowledge about individual stocks and species (Appendix Tables 3-4) provides an important metric to measure the progress of NOAA Fisheries towards meeting its mandates under the MMPA and ESA. To that end, the levels of information available for each stock should be updated.

Literature Cited

Barlow, J.; Swartz, S.L.; Eagle, T.C.; Wade, P.R. 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-95-6. 76 p.

NMFS. 2001. Marine fisheries stock assessment improvement plan: report of the National Marine Fisheries Service National Task Force for Improving Fish Stock Assessment. Second ed. (rev.) U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/SPO-56. 69 p.

Wade, P.R.; Angliss, R.P. 1997. Guidelines for assessing marine mammal stocks: report of the GAMMS Workshop, April 3-5, 1996, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12. 93 p.

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Appendix Table 1. Detailed protected species mandates within NOAA Fisheries

Strategic Goal	Strategic Objective	Program Component	Mandate	Protected Species Science Information Requirements	Protected Species Management Requirements	Program Component Capabilities
Ecosystems	Objective B: Protect, Restore and Manage species and their habitats listed under the Endangered Species and Marine Mammal Protection Acts.	Protected Species Listing	ESA §§ 4(b), MMPA §§ 112 (e), 115 (a)	An extinction risk analysis which uses: Stock ID, Abundance, Anth. Mortality, Natl mortality, non-lethal effects, assessment frequency, demography, habitat use, Food habits	Make Listing/De-listing determinations, Designate Critical Habitat, Evaluate Conservation efforts, evaluate economic and other relevant impacts, review petitions, conduct proactive conservation efforts	Listing/De-listing determinations
						Critical Habitat
						Species of Concern
		Protected Species Recovery	ESA §§ 4©)(2), 4(f), 4(g),MMPA §§ 103(f), 115(b)	An assessment of population viability which uses: Stock ID, Abundance, Anth. Mortality, Natl mortality, non-lethal effects, assessment frequency, demography, habitat use, Food habits, Artificial propagation information.	Develop Recovery Plans /Conservation plans, Implement recovery plans, administer recovery teams, complete reports to congress on recovery, conduct post-delisting monitoring, complete 5 yr. status reviews, develop guidance	Pacific Salmon Recovery
						Marine Turtle
						Other Species
						Marine Mammal
						Status Review Updates

Strategic Goal	Strategic Objective	Program Component	Mandate	Protected Species Science Information Requirements	Protected Species Management Requirements	Program Component Capabilities
		Protected Species	ESA §§ 2		Outreach, education,	Outreach
						Education
						Environmental
		Protected Species Partnerships with States,Tribes and Local Entities	ESA §§ 4(f), 6, 10(a)(1)(B), MMPA §§ 109,112,119		Approve Management Agreements/Review State Programs/Issue funding/Develop Habitat Conservation Plans	ESA section 6 agreements
						PCSRF
						MMPA agreements
						Habitat Conservation
		Protected Species Federal ESA Consultations	ESA §§ 7	Stock ID, Abundance, Anth. Mortality (including gear interactions, Natl mortality, non-lethal effects, assessment frequency, demography, habitat use, Food habits, physiology, ecological relationships to habitat	Review Federal Programs	Section 7consultations
						Streamlined Section 7
						Section 7 training and
		Protected Species Cooperation on International issues	ESA §§ 8(b), 8A,MMPA §§ 108, Whaling		Encourage International Conservation, regulate trade in listed species	ESA/CITES

Strategic Goal	Strategic Objective	Program Component	Mandate	Protected Species Science Information Requirements	Protected Species Management Requirements	Program Component Capabilities
			Convention Act			
						MMPA/IWC
		Protected Species Marine Mammal Health and Stranding Response	MMPA Title IV	Collect and periodically update: 1)data on rescuing and rehab'ing on species by species basis to determine when animal can be returned to wild , 2) collect, preserve, tissues for physical chemical and biological analyses, 3) regional stranding by numbers, 4) regional stranding by conditions, 5) regional stranding by causes of illness and deaths, 6) compare illness and deaths with physical, chemical, and biological environmental parameters	Establish Marine Mammal Health and Stranding Program, develop guidance on release of rehabilitated marine mammals, establish a marine mammal tissue bank, respond to unusual mortality events, establish stranding response agreements	Marine Mammal Stranding/Response
						Marine Mammal
						Prescott grants
		Protected Species Marine Mammal Fishery Interactions	MMPA §§ 104(h), 118,301 and others, Tuna convention Act,	Stock ID, Abundance, Anth. Mortality, Natl mortality, non-lethal effects, assessment frequency, demography, habitat use, Food habits,	Establish International Dolphin Conservation Program, issue regs for IDCP, issue authorizations for commercial fishing	Tuna/DolphinProgram

Strategic Goal	Strategic Objective	Program Component	Mandate	Protected Species Science Information Requirements	Protected Species Management Requirements	Program Component Capabilities
			Dolphin Protection Consumer Information Act	physiology, ecological relationships to habitat, subsistence harvest Non-lethal impacts of encirclement		
						Fishery
						Take Reduction
		Protected Species Enforcement	ESA §§ 11, MMPA §§ 103(a), 107,301		Conduct Enforcement	ESA/MMPA Enforcement
		Protected Species Regulatory Streamlining	NEPA, ESA Section 7			NEPA Frontloading
						Review of NEPA
		Protected Species Permitting/Take Authorization	ESA §§ 4(d),10,MMPA §§ 101(a)(5),104,118	Stock ID, Abundance, Anth. Mortality, Natl mortality, non-lethal effects, assessment frequency, demography, habitat use, Food habits, physiology, ecological relationships to habitat, subsistence harvest	Issue Permits for Research and Enhancement (MMPA Public display as well as scientific research and enhancement), issue small take authorizations for MM, issue permits for incidental take, authorize release of experimental populations, develop/administer protective regulations, permit incidental take in commercial fisheries	Research and Enhancement
						Incidental Take

Strategic Goal	Strategic Objective	Program Component	Mandate	Protected Species Science Information Requirements	Protected Species Management Requirements	Program Component Capabilities
						4(d) protective
						MMPA Commercial

Appendix Table 2. Regulatory requirements for marine mammal data and information

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
ESA General			
ESA § 4	Listing E & T Spp	best scientific and commercial data only specific criteria currently under development	1. Threats to habitat 2. Utilization 3. Disease/predation 4. Existing regulatory mechanisms 5. Quantitative assessment of other impacts natural/manmade (human-related mortality) 6. Abundance & trends 7. Stock Structure
ESA § 4	Designating Critical Habitat	best scientific and commercial data AND economic impact	1. Season/temporal/spatial habitat use
Dredging Activites			
ESA § 7	Jeopardy Adverse Modif. of CH Efficacy of RPAs/RPMs Exemption require	"Appreciably" affect survival and recovery of spp in the wild	1. Abundance 2. Stock structure 3. Human related mortality (quantitative assessment) 4. Characteristics of human related mortality 5. Seasonal distribution 6. Animal movements 7. Trends in abundance, mortality, and distribution 8. Habitat utilization and structure 9. Ecological relationships in habitat 10. Nature of threats 11. Quantitative assessment of impact of threats 12. Unusual mortality events 13. Cumulative impacts of non-lethal stressors 14. Existence value data 15. Behavior (e.g. feeding, foraging) 16. Process information (e.g. how animals respond to sound) 17. Physiology

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
ESA § 10	Permits for incidental take	take must be incidental min/mitigate impact no jeopardy	See parameters under Section 7, above
MMPA § 103 and 104	Permits for taking or importation	Factors considered in regulations: -existing and future levels of mm spp and stocks -existing int'l treaty obligations of US -marine ecosystem and related env considerations -economic and technological feasibility of implementation of Sec 103 **-Every 12 months, Secty must publish and report to Congress on status of all marine mammal species and population stocks subject to MMPA** Sec 104 any permit must specify : # and kind of animals location and manner of taking period for permit validation any other terms and conditions approp Harassment– differentiate level A & B	1) existing and future levels of mm spp and stocks 2) existing int'l treaty obligations of US 3) marine ecosystem and related env considerations 4) economic and technological feasibility of implementation of Sec 103 5 through 8 are based on sec 117 determinations, see below) 9) any other terms and conditions approp based partly on Sec 117 info but may include things like affects of acoustics and vessel traffic 10) Harassment–be able to differentiate between level A & B and resultant impacts
Fishing Activites			
ESA § 7	Jeopardy Adverse Modif. of CH Efficacy of RPAs/RPMs Exemption require	"Appreciably" affect survival and recovery of spp in the wild	See list under dredging 4. Under category 4 particularly important is data on characteristics of ntanglement so that gear solutions can be considered
ESA § 10	Permits for incidental take	take is incidental min/mitigate impact no jeopardy	

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
MMPA § 104	Permits for taking or importation	Factors considered in regulations: -existing and future levels of mm spp and stocks -existing int'l treaty obligations of US -marine ecosystem and related env considerations -economic and technological feasibility of implementation of Sec 103 **-Every 12 months, Secty must publish and report to Congress on status of all marine mammal species and population stocks subject to MMPA** Sec 104 any permit must specify : # and kind of animals location and manner of taking period for permit validation any other terms and conditions approp Harassment– differentiate level A & B	1) existing and future levels of mm spp and stocks 2) existing int'l treaty obligations of US 3) marine ecosystem and related env considerations 4) economic and technological feasibility of implementation of Sec 103 5 through 8 are based on sec 117 determinations, see below) 9) any other terms and conditions approp based partly on Sec 117 info but may include things like affects of acoustics and vessel traffic 10) Harassment–be able to differentiate between level A & B and resultant impacts
MMPA § 118	Incidental Taking in Commercial Fisheries	Secty must publish annually a list of fisheries with a statement of marine mammals and the approx number of vessels or persons involved in each fishery, specifying if it has incidental taking of marine mammals that is -frequent -occasional, or -a remote likelihood/no known incidental take Observers to be prioritized based on fisheries taking depleted species, declining, others	1) geographic range 2) temporal and seasonal variation in range 3)minimum population estimate 4)current and maximum productivity rates 5) current population trend, 6) estimate of the annual human-caused mortality or serious injury of the stock by source 7) commercial fishery interactions with stock **including**: -approx # vessels, -estimated level of serious injury or mortality, seasonal or area differences, -rate based on standard unit of fishing effort 8) Estimate take rate relative to PBR
Marine Operations (DOD, USCG)			

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
ESA § 7	Jeopardy Adverse Modif. of CH Efficacy of RPAs/RPMs Exemption require	"Appreciably" affect survival and recovery of spp in the wild	See list under dredging Section 7 Key elements: 1. Seasonal distribution 2. Behavior (e.g. feeding, foraging) 3. Process information (e.g. how animals respond to sound) 4. Physiology (effects of sound in the ocean, TSS)
ESA § 10	Permits for incidental take	take is incidental min/mitigate impact no jeopardy	
MMPA § 104	Permits for taking or importation	Factors considered in regulations: -existing and future levels of mm spp and stocks -existing int'l treaty obligations of US -marine ecosystem and related env considerations -economic and technological feasibility of implementation of Sec 103 **-Every 12 months, Secty must publish and report to Congress on status of all marine mammal species and population stocks subject to MMPA** Sec 104 any permit must specify : # and kind of animals location and manner of taking period for permit validation any other terms and conditions approp Harassment– differentiate level A & B	1) existing and future levels of mm spp and stocks 2) existing int'l treaty obligations of US 3) marine ecosystem and related env considerations 4) economic and technological feasibility of implementation of Sec 103 5 through 8 are based on sec 117 determinations, see below) 9) any other terms and conditions approp based partly on Sec 117 info but may include things like affects of acoustics and vessel traffic 10) Harassment–be able to differentiate between level A & B and resultant impacts
Oil and Gas Exploration/leasing (MMS)			
ESA § 7	Jeopardy Adverse Modif. of CH Efficacy of RPAs/RPMs Exemption require	"Appreciably" affect survival and recovery of spp in the wild	See Section 7 for dredging and add acoustics issues under Navy Key element; offshore species are of importance (least well known, info difficult to get)

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
ESA § 10	Permits for incidental take	take is incidental min/mitigate impact no jeopardy	
MMPA § 104	Permits for taking or importation	Factors considered in regulations: -existing and future levels of mm spp and stocks -existing int'l treaty obligations of US -marine ecosystem and related env considerations -economic and technological feasibility of implementation of Sec 103 **-Every 12 months, Secty must publish and report to Congress on status of all marine mammal species and population stocks subject to MMPA** Sec 104 any permit must specify : # and kind of animals location and manner of taking period for permit validation any other terms and conditions approp Harassment– differentiate level A & B	1) existing and future levels of mm spp and stocks 2) existing int'l treaty obligations of US 3) marine ecosystem and related env considerations 4) economic and technological feasibility of implementation of Sec 103 5 through 8 are based on sec 117 determinations, see below) 9) any other terms and conditions approp based partly on Sec 117 info but may include things like affects of acoustics and vessel traffic 10) Harassment–be able to differentiate between level A & B and resultant impacts
Scientific Research			
ESA § 7	Jeopardy Adverse Modif. of CH Efficacy of RPAs/RPMs Exemption require	"Appreciably" affect survival and recovery of spp in the wild	
ESA § 10	Permits for incidental take	take is incidental min/mitigate impact no jeopardy	

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
MMPA § 104	Permits for taking or importation	Factors considered in regulations: 1) existing and future levels of mm spp and stocks 2) existing int'l treaty obligations of US 3) marine ecosystem and related env considerations 4) economic and technological feasibility of implementation of Sec 103 5)Every 12 months, Secty must publish and report to Congress on status of all marine mammal species and population stocks subject to MMPA Sec 104 any permit must specify: 6) # and kind of animals 7) location and manner of taking 8) period for permit validation 9) any other terms and conditions approp 10) Harassment– differentiate level A & B	1) existing and future levels of mm spp and stocks 2) existing int'l treaty obligations of US 3) marine ecosystem and related env considerations 4) economic and technological feasibility of implementation of Sec 103 5 through 8 are based on sec 117 determinations, see below) 9) any other terms and conditions approp based partly on Sec 117 info but may include things like affects of acoustics and vessel traffic 10) Harassment–be able to differentiate between level A & B and resultant impacts
MMPA General			
MMPA § 110 (d)	Gulf of Maine and Bering Sea Ecosystem Protection	GOM - assess all human -caused factors affecting health and stability of the marine **ecosystem** of which marine mammals are a part BS - no later than 180b d after enactment of 1994 MMPA amendments, undertake scientific research program to monitor the health and stability of the Bering Sea marine ecosystem and to resolve uncertainties in decline of mm, sea birds and other living marine resources, shall include subsistence use and ways to provide such opportunity	

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
MMPA § 115	Species status determinations	1) designation as depleted, or determination that a species should no longer be desig as depleted 2) status review required within 210 days after receipt of petition	See Section 117 Information requirements
MMPA § 117	Stock Assessments	Annually produce Stock Assessment Report for each marine mammal stock which occurs in US waters specifying: 1) geographic range of affected stock, including any temporal and seasonal variation in range 2) provide minimum population estimate, current and maximum productivity rates and current population trend, including a description of the information upon which these are based 3) estimate of the annual human-caused mortality or serious injury of the stock by source and, for a strategic stock, other factors that may be causing a decline or impeding recovery of the stock including effects of marine mammal habitat and prey 4) describes commercial fisheries that interact with stock including approx # vessels, estimated level of serious injury or mortality, seasonal or are differences, rate based on standard unit of fishing effort 5) categorize stock as: - level of human caused injury/Mort not likely to cause stock to be reduced below OSP or -is a strategic stock 6) Estimate PBR, describing the info used to calculate it , including the recovery factor	1) geographic range 2) temporal and seasonal variation in range 3)minimum population estimate 4)current and maximum productivity rates 5) current population trend, 6) estimate of the annual human-caused mortality or serious injury of the stock by source 7) for a strategic stock, other factors causing a decline or impeding recovery (effects of habitat and prey) 8) commercial fishery interactions with stock **including**: -approx # vessels, -estimated level of serious injury or mortality, seasonal or area differences, -rate based on standard unit of fishing effort 9) level o f human caused injury/Mort not likely to cause stock to be reduced below OSP or not 10) Estimate PBR, choose recovery factor
MMPA § 301	Tuna Dolphin Conservation Program		

Legislation/ Part	Decision Type	Decision Criteria/Standard	Information Required to Make Decision
MMPA § 401	Marine Mammal Health and Stranding Program	1) facilitate collection and dissemination of ref data on health of mm and health trends worldwide 2) correlate health of marine mammals and marine mammal populations in the wild , with available data on physical, chemical and biological environmental parameters 3) coordinate responses pt unusual mortality events	Collect and periodically update: 1) data on rescuing and rehab'ing on species by species basis to determine hen animal can be returned to wild 2) collect, preserve, tissues for physical chemical and biological analyses 3) regional stranding by numbers 4) regional stranding by conditions 5) regional stranding by causes of illness and deaths 6) compare illness and deaths with physical, chemical, and biological environmental parameters
MMPA § 117	Unusual Mortality Event	1) determine whether an unusual event is occurring 2) determine when response no longer necessary 3) develop contingency plan to assist Secty in responding	1) info to determine whether an unusual event is occurring 2) info to determine when response no longer necessary 3) info to develop criteria for types of tissues and analyses needed 4) info care techniques and affects to minimize deaths and provide approp care 5) numbers, size, sex info to analyze effects on affected populations 6) physical, chemical, and biological data including contaminants

Appendix Table 3. Data quality and status of U.S. marine mammal stocks by region.

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
	ALASKAN CETACEANS								
AK	Beaked whales	N	1	0	0	0	0	0	0
AK	Beluga whale, Beaufort Sea stock	N	1	3	1	2	4	1	1
AK	Beluga whale, Bristol Bay stock	N	1	3	1	1	1	2	1
AK	Beluga whale, Cook Inlet stock	Y	2	3	2	3	4	4	3
AK	Beluga whale, eastern Bering Sea stock	N	1	3	1	3	0	2	1
AK	Beluga whale, eastern Chukchi Sea stock	N	1	3	1	1	4	2	1
AK	Bowhead whale	Y	2	3	2	4	4	3	4
AK	Dall's porpoise	N	1	0	0	2	2	1	1
AK	Fin whale	Y	1	1	0	1	2	1	1
AK	Gray whales, E. North Pacific stock	N	1	3	2	3	1	3	4
AK	Harbor porpoise, Bering Sea stock	N	1	1	0	3	2	1	1
AK	Harbor porpoise, Gulf of Alaska stock	N	1	1	0	3	2	1	1
AK	Harbor porpoise, SE Alaska stock	N	1	1	0	3	2	1	1
AK	Humpback whales, C. North Pacific stock	Y	1	3	2	1	2	1	1
AK	Humpback whales, W. North Pacific stock	Y	1	3	2	1	1	1	1
AK	Killer whale, E. North Pacific resident stock	N	1	3	2	1	1	2	1
AK	Killer whale, E. North Pacific transient stock	N	1	3	1	1	1	1	1

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
AK	Minke whale	N	1	0	0	0	1	0	0
AK	Pacific white-sided dolphin	N	1	0	0	1	2	1	1
AK	Right whale, North Pacific	Y	1	2	0	*1*	0	0	0
AK	Sperm whale	Y	1	0	0	0	0	0	0
	ALASKAN PINNIPEDS								
AK	Ribbon seal	N	1	0	0	0	0	0	0
AK	Bearded seal	N	1	0	0	0	0	0	0
AK	Harbor seal, BS	N	2	4	1	3	3	2	2
AK	Harbor seal, GOA	N	2	4	1	3	3	2	2
AK	Harbor seal, SE	N	2	4	1	3	3	2	2
AK	Northern fur seal	Y	1	2	2	*3*	3	3	3
AK	Ringed seal	N	1	0	0	0	0	0	0
AK	Spotted seal	N	1	0	0	0	0	0	0
AK	Steller sea lion, eastern stock	Y	2	3	2	3	3	4	4
AK	Steller sea lion, western stock	Y	2	3	2	3	3	4	4
	ATLANTIC CETACEANS								
NE	North Atlantic right whale	Y	1	3	3	1	2	4	3
NE	Humpback whale	Y	1	4	3	3	2	4	3
NE	Fin whale	Y	1	2	1	2	4	4	2

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
NE	Sei whale	Y	1	0	1	0	4	3	1
NE	Minke whale	N	2	2	1	3	2	4	2
NE	Blue whale	Y	1	2	1	1	4	3	1
NE	Sperm whale	Y	1	1	1	2	4	4	2
NE	Killer whale	N	1	0	0	0	1	0	1
NE	Northern bottlenose whale	N	1	1	1	0	0	3	1
NE	Cuvier's beaked whale	Y	1	0	0	2	2	4	2
NE	Mesoplodon beaked whales	Y	1	0	0	2	2	4	2
NE	Risso's dolphin	N	1	1	0	3	2	3	2
NE	Pilot whale, long-finned	Y	1	2	2	3	2	4	2
NE	Atlantic white-sided dolphin	N	1	1	1	2	2	4	2
NE	White beaked dolphin	N	1	0	0	0	1	3	1
NE	Common dolphin	Y	1	*2?*	2	2	2	4	2
NE	Atlantic spotted dolphin	N	2	2	0	2	2	3	2
NE	Striped dolphin	N	1	1	0	2	2	3	2
NE	Spinner dolphin	N	1	0	0	0	2	3	1
NE	Harbor porpoise	Y	2	3	1	3	4	4	2
SE	Bottlenose Dolphin - offshore WNA stock	N	1	1	1	*2*	2	3	2
SE	Bottlenose Dolphin - coastal WNA stock	Y	2	2	1	3	2	4	2

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
SE	Clymene dolphin	N	1	1	1	1	0	2	1
SE	Dwarf Sperm Whale	N	1	1	0	0	1	3	2
SE	Pygmy Sperm Whale	Y	1	1	0	0	0	1	1
SE	Pygmy Killer Whale	N	1	1	1	0	0	0	0
SE	Melon-headed Whale	N	1	1	1	0	0	0	0
SE	Fraser's Dolphin	N	1	1	1	0	0	0	0
SE	Pantropical Spotted Dolphin	N	2	2	0	2	2	3	2
SE	Pilot whale, short-finned	Y	1	2	2	0	2	3	2
	GULF OF MEXICO CETACEANS								
SE	Bottlenose Dolphin: Inner Continental Shelf Stocks (East)	N	1	1	1	1	1	1	1
SE	Bottlenose Dolphin: Inner Continental Shelf Stocks (West)	N	1	1	1	1	1	1	1
SE	Bottlenose Dolphin: Inner Continental Shelf Stocks (Oceanic)	N	1	1	1	1	1	1	1
SE	Bottlenose Dolphin: Outer Continental Shelf	N	1	1	1	2	1	1	1
SE	Bottlenose Dolphin: Shelf Edge and Slope	N	1	1	1	1	1	1	1

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
SE	Bottlenose Dolphin: Bays, Sounds, and Estuaries	Y	1	1	2	1	1	1	1
SE	Atlantic Spotted Dolphin	N	1	2	1	1	1	1	1
SE	Rough-toothed Dolphin	N	1	1	1	1	0	1	1
SE	Pantropical Spotted Dolphin	N	1	1	1	2	1	1	1
SE	Striped Dolphin	N	1	1	1	1	0	1	1
SE	Spinner Dolphin	N	1	1	1	1	0	1	1
SE	Fraser's Dolphin	N	1	1	1	1	0	1	1
SE	Risso's Dolphin	N	1	1	1	1	0	1	1
SE	Pygmy Killer Whale	N	1	1	1	1	0	1	1
SE	Melon-headed Whale	N	1	1	1	1	0	1	1
SE	False Killer Whale	N	1	1	1	1	0	1	1
SE	Killer Whale	N	1	1	1	1	0	1	1
SE	Short finned Pilot Whale	Y	1	1	1	1	1	1	1
SE	Sperm Whale	Y	1	1	1	2	0	1	1
SE	Dwarf Sperm Whale	Y	1	1	0	0	0	1	1
SE	Pygmy Sperm Whale	Y	1	1	0	0	0	1	1
SE	Cuvier's Beaked Whale	Y	1	1	0	0	0	1	1
SE	Blainville's Beaked Whale	N	1	1	0	0	0	1	1

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
SE	Gervais' Beaked Whale	N	1	1	0	0	0	1	1
SE	Bryde's Whale	N	1	1	1	1	0	1	1
	ATLANTIC PINNIPEDS								
NE	Harbor seal	N	1	1	1	1	4	4	2
NE	Gray seal	N	1	2	1	*1*	4	4	2
NE	Harp seal	N	2	3	3	*2*	4	4	2
NE	Hooded seal	N	2	3	2	*2*	4	3	2
	WEST COAST CETACEANS								
SW	Harbor porpoise: Morro Bay Stock	N	1	3	1	2	0	3	3
SW	Harbor porpoise: Monterey Bay Stock	Y	1	3	2	2	3	3	3
SW	Harbor porpoise: San Francisco/Russian River Stock	N	1	3	1	2	1	3	3
SW	Harbor porpoise: N. California, S. Oregon Stock	N	1	3	1	2	1	3	3
SW	Harbor porpoise: Washington/Oregon Coast Stock	N	1	3	1	2	1	3	3
SW	Harbor porpoise: Washington Inland Waters Stock	N	1	3	1	2	0	3	3
SW	Dall's porpoise	N	2	2	2	2	3	3	2
SW	Pacific white sided dolphin	N	2	2	2	2	3	3	2

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
SW	Risso's Dolphin	N	1	0	0	3	3	3	2
SW	Bottlenose Dolphin: California Coastal Stock	N	1	1	1	3	2	3	2
SW	Bottlenose Dolphin: California, Oregon, Washington Offshore Stock	N	1	1	1	3	2	3	2
SW	Striped Dolphin	N	1	0	1	3	2	3	2
SW	Short-beaked Common Dolphin	N	1	1	2	2	4	3	2
SW	Long-beaked Common Dolphin	N	1	0	2	3	3	3	2
SW	Northern Right-whale Dolphin	N	2	2	2	2	3	3	2
SW	Killer Whale: Eastern North Pacific Transient Stock	N	1	3	1	1	2	3	2
SW	Killer Whale: Eastern North Pacific Offshore Stock	N	1	3	1	1	2	3	2
SW	Killer Whale: Eastern North Pacific Southern Resident Stock	N	1	3	2	1	0	3	2
SW	Short-finned Pilot Whale	N	1	0	1	2	3	3	2
SW	Baird's Beaked Whale	N	1	0	0	3	3	3	2
SW	Mesoplodon Beaked Whales	N	1	0	0	2	2	3	2
SW	Cuvier's Beaked Whale	N	1	0	0	2	3	3	2

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
SW	Pygmy Sperm Whale	N	1	0	0	2	2	3	2
SW	Sperm Whale	Y	1	0	1	2	3	3	2
SW	Humpback Whale	Y	1	2	2	3	2	4	3
SW	Blue Whale	Y	1	1	2	3	4	3	2
SW	Fin Whale	Y	1	0	1	3	2	3	2
SW	Bryde's Whale	N	1	0	0	2	2	3	2
SW	Sei Whale	Y	1	0	1	0	4	3	2
SW	Minke Whale	N	1	0	1	2	2	3	2
	HAWAIIAN CETACEANS								
PI	Rough-toothed Dolphin	N	1	0	0	1	0	1	1
PI	Risso's Dolphin	N	1	0	0	0	1	1	1
PI	Bottlenose Dolphin	N	1	0	1	1	1	1	1
PI	Pantropical Spotted Dolphin	N	1	0	1	1	0	1	1
PI	Spinner Dolphin	N	1	0	1	1	1	1	1
PI	Striped Dolphin	N	1	0	1	1	0	1	1
PI	Melon-headed Whale	N	1	0	0	1	0	1	1
PI	Pygmy Killer Whale	N	1	0	0	0	0	1	1
PI	False Killer Whale	N	1	0	0	1	2	1	1
PI	Killer Whale	N	1	0	1	0	0	1	1

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
PI	Short-finned Pilot Whale	N	1	0	1	1	1	1	1
PI	Blainville's Beaked Whale	N	1	0	0	1	0	1	1
PI	Cuvier's Beaked Whale	N	1	0	0	1	0	1	1
PI	Pygmy Sperm Whale	N	1	0	0	0	0	1	1
PI	Dwarf Sperm Whale	N	1	0	0	0	0	1	1
PI	Sperm Whale	Y	1	0	1	1	0	1	1
PI	Blue Whale	Y	1	0	1	0	0	1	1
PI	Fin Whale	Y	1	0	1	0	0	1	1
PI	Bryde's Whale	N	1	0	0	0	0	1	1
PI	Cetaceans of Northern Mariana Islands*	N	1	0	0	0	0	0	0
PI	Cetaceans of Guam*	N	1	0	0	0	0	0	0
PI	Cetaceans of Wake Island*	N	1	0	0	0	0	0	0
PI	Cetaceans of Johnston Atoll*	N	1	0	0	0	0	0	0
PI	Cetaceans of Palmyra Island*	N	1	0	0	0	0	0	0
PI	Cetaceans of Howland and Baker Islands*	N	1	0	0	0	0	0	0
PI	Cetaceans of Jarvis Island*	N	1	0	0	0	0	0	0
PI	Cetaceans of American Samoa*	N	1	0	0	0	0	0	0
	EASTERN TROPICAL PACIFIC DOLPHINS								
SW	Spotted Dolphin: Northeastern Stock	N	2	3	2	3	4	3	4

Region	Stock	Strategic in 2003?	Tier	Stock ID	Life History	Abundance Number	Anthropogenic Impacts - Fishery Mortality	Assessment	
								Frequency	Quality
SW	Spotted Dolphin: Western/southern Stock	N	2	3	2	3	4	3	2
SW	Spotted Dolphin: Coastal Stock	N	2	3	1	2	4	3	2
SW	Spinner Dolphin: Eastern Stock	N	2	3	2	3	4	3	4
SW	Spinner Dolphin: White belly Stock	N	2	3	2	3	4	3	2
SW	Spinner Dolphin: Costa Rican Stock	N	1	3	1	0	4	3	*2*
SW	Spinner Dolphin: Tres Marias Stock	N	1	3	1	0	4	3	*2*
SW	Common Dolphin: Northern Stock	N	2	3	1	3	4	3	2
SW	Common Dolphin: Southern Stock	N	2	3	1	3	4	3	2
SW	Common Dolphin: Central Stock	N	2	3	2	3	4	3	2
	WEST COAST PINNIPEDS								
SW	California Sea Lion	N	2	3	2	2	4	4	3
SW	Harbor Seal: California Stock	N	2	3	2	2	4	4	2
SW	Harbor Seal: Oregon & Washington Coastal Waters	N	2	3	2	3	2	3	2
SW	Harbor Seal: Washington Inland Waters Stock	N	2	3	2	3	3	3	2
SW	Northern Elephant Seal Stock	N	2	2	2	2	4	3	3
SW	Guadalupe Fur Seal	Y	1	0	2	1	2	2	2
SW	Northern Fur Seal	N	2	3	2	2	2	3	3
PI	Hawaiian Monk Seal	Y	1	2	2	1	1	4	3

**Species/stock inventories are not available for U.S. EEZ areas in Pacific Islands outside of Hawaii. Endemic stocks of several species are expected in each of these areas

Appendix Table 4. Data quality and status of U.S. marine turtle stocks by region

Region	Stock	Status in 2003	Tier	Stock ID	Life History	Abundance		Anthropogenic Impacts	Assessment	
						Nesting	In-Water		Frequency	Quality
	ATLANTIC, GULF OF MEXICO, & CARRIBEAN									
SE/ NE	Loggerhead	T	1-2	2	2	4	1	2	3	2
SE/ NE	Green Turtle	E/T	1	2	2	4	1	2	1	1
SE/ NE	Leatherback	E	1	2	1	4	1	2	3	1
SE	Hawksbill	E	1	2	2	4	1	1	2	1
SE/ NE	Kemp's ridley	E	1-2	n/a	2	4	1	2	3	2
SE	Olive ridley	E	1	2	2	n/a	0	1	0	0
	PACIFIC									
SW	Loggerhead	T	1	2	2	n/a	0	2	3	1
SW	Green Turtle - HI	T	1	2	2	4	1	2	3	1
SW	Green Turtle - Other[1]	T	1	2	1	1	0	1	3	1
SW	Green Turtle - East Pacific	E	1	2	2	n/a	1	2	3	1
SW	Leatherback	E	1	2	1	n/a	1	2	3	1
SW	Hawksbill	E	1	2	½	1	0	1	3	1
SW	Olive ridley	E/T	1	2	2	n/a	0	2	3	1

1. "Green Turtle - Other" is a construct meant to separate out other populations of Pacific green turtles from the Hawaiian and East Pacific greens

APPENDIX I

Legislative Mandates for NOAA Fisheries under the Endangered Species Act and Marine Mammal Protection Act

1. The Endangered Species Act (ESA)

Section 4 of the ESA is "Determination of endangered and threatened species," and covers listing/delisting and recovery planning activities and requires the Secretary to determine if a species is endangered or threatened based on five criteria, determine if a listed species should be removed from the list, identify critical habitat (if applicable) and develop recovery plans that specify management activities that provide for recovery. Recovery planning is aimed at delivering the main objective of the ESA: species recovery and removal from the list. Under this section, plans are developed by experts to remove or alleviate the threats affecting threatened and endangered species so that they can again become a functioning element of the ecosystem, no longer in danger of extinction.

In order to accomplish listing and recovery under the ESA, information about the following must be assessed: threats to habitat, utilization of the species, impacts of disease/predation; quantitative assessment of other impacts, natural/manmade (human-related mortality), species abundance & trends, population structure, evaluation of existing regulatory mechanisms, and evaluation of existing conservation mechanisms. These are a combination of science and management needs. For determination of critical habitat, additional information on the following is needed: temporal and spatial habitat use (historic/current), economic data for exclusion process, essential constituent elements (abiotic/biotic environment), threats to habitat (to evaluate the need for special management considerations), and ecological relationships within species habitats.

Section 6 of the ESA concerns"Cooperation with the States." This section fosters partnerships with states to assist in recovering and protecting listed species through development of management agreements. Effective management plans require the same information as recovery planning, but are more specific to the smaller geographical regions of states.

Section 7 of the ESA describes the "Interagency cooperation" process. This section contains the consultation provisions for federal actions. NOAA Fisheries must determine whether the action permitted, funded or carried out by any federal agency is in compliance with the jeopardy and adverse modification of critical habitat standards. Section 7 (a) (2) requires that federal actions do not jeopardize the continued existence of any species or result in destruction or adverse modification of critical habitat. NOAA Fisheries works with action agencies to evaluate their activities, when requested, and if adverse effects are likely to occur, works with the agency to eliminate to minimize those effects, consistent with the original action.

If adverse effects cannot be eliminated, NOAA Fisheries must develop conservation measures to mitigate and minimize the remaining effects. Such measures become the mandatory

requirements of an incidental take authorization, if one is required. The numbers of animals expected to be taken must also pass the jeopardy and adverse modification determinations. In rare cases, no alternatives to jeopardy can be found consistent with the federal activity and the Agency must seek an ESA exemption.

These analyses of the effects of an action require a suite of data and information similar to that required for listing and recovery. The consultation provisions use a survival standard and then require conservation actions to minimize taking that may still occur after jeopardy or adverse modification of critical habitat is no longer an issue. This again is combination of science and management needs. Enough data and information on the species status and expected impacts from the action are needed to make the best decisions: decisions that minimize both the effects of an activity on listed species and the socioeconomic implications of the changes to the proposed action, consistent with its original purpose. Otherwise, in the face of uncertainty, the ESA requires the benefit of the doubt be given to the species and can result in overly precautionary and costly measures that, with better information, may have been avoided.

Scientific uncertainty can also leave the Agency more vulnerable to lawsuits and constituent discontent. Conversely, better information allows NOAA Fisheries to develop conservation measures that minimize human impacts effectively, thus reducing the potential for loss of a species due to measures that are not sufficiently risk averse. The one aspect that differs from listing and recovery requirements is the greater demand for technological developments that provide options for an activity that impacts listed species.

Section 8 of the ESA addresses "International Cooperation" matters concerning listed species. This section was included in the ESA to "demonstrate the commitment of the United States to worldwide protection of endangered and threatened species" and directs the Secretary of Commerce to provide foreign countries with assistance in developing conservation programs. The primary interaction the U.S. has internationally on endangered species is the Convention on International Trade in Endangered Species and for cetaceans through the International Whaling Commission.

Section 10 of the ESA, "Exceptions", provides a mechanism for NOAA Fisheries to authorize direct takes of listed species for scientific research or to enhance the survival of the affected species, or for incidental take during otherwise lawful activities not included under Section 7 (private citizens or non-federal agencies), as long as the takings meet the jeopardy and adverse modification standards. For incidental take authorizations, conservation plans must be developed that will minimize the impacts. This section's requirements reinforce the same needs with respect to determining impacts of takes on survival, and development of conservation alternatives and measures as indicated in the previous discussion of Sections 4 and 7.

2. The Marine Mammal Protection Act (MMPA)

Section 101 of the MMPA contains exceptions to the prohibition on taking marine mammals by harassment (for activities other than during commercial fishing) and other incidental taking of

marine mammals (e.g., oil and gas exploration and development). Restrictions on import of yellowfin tuna that are caught by international purse seine fleets in the Eastern Tropical Pacific that capture dolphins are addressed in this section. The Secretary is required to issue authorizations for harassment of marine mammals in the course of otherwise lawful activities if certain criteria are met: the harassment taking must have a negligible impact on species or stock, will not disrupt subsistence use, must have least practicable impact on species or stock, etc. This means that adequate information is required to make decisions on both the status of the species or stock, and the impacts of activities on the individual animals.

Section 103 of the MMPA prescribes exacting requirements for issuance of regulations on the taking and importation of each species of marine mammals, and requires the Secretary to annually provide Congress with a report "that describes the current status of ALL (emphasis added) all marine mammal species and population stocks ...and describe those actions taken and those measures believed necessary ...to assure the well-being of such marine mammals (MMPA Section 103 (f))." Clearly, Congress intended the Secretary of Commerce, as delegated to NOAA, to understand the status of every marine mammal species and population stock to some degree, as determined by the Secretary, that will "assure the well–being" of these animals.

This capability is one of the most specific of NOAA's mandate that is woefully under funded. The most well known example of the problems that can be caused under this section with inadequate science is the Navy's application on the use of acoustics that may harass marine mammals. Enough information on the potential impacts of sound on marine mammals is not available to make focused management decisions on permit requirements or on determining harm to affected animals. This has resulted in costly unresolved litigation and no benefit for the conservation of marine mammals.

Section 104 allows for permits for directed taking and importation of marine mammals for scientific research, public display, or enhancing the survival or recovery of a species or stock, consistent with regulations published under Section 103. This means that in order to issue the permit, NOAA needs information on the status of the species as well as the impacts of the proposed activity.

Section 117 of the MMPA contains the stock assessment provisions. Again the legislation provides a clear prescriptive mandate from Congress to "prepare a stock assessment report for each marine mammal stock which occurs" in U.S. waters, "each stock assessment, based on the best scientific information available, shall--

(1) describe the geographic range of affected stock, including any seasonal or temporal variation;

(2) provide for such stock the minimum population estimate, current and maximum net productivity rates, current population trend, including a description of the information upon which these are based;

(3) estimate the annual human caused mortality and serious injury of the stock by source and, for a strategic stock, other factors that may be causing a decline or impeding recovery

of the stock, including effects on marine mammal habitat and prey;
(4) describe commercial fisheries that interact with the stock, including –approximate number of vessels actively participating in each such fishery; the estimated level of incidental mortality and serious injury of the stock by each such fishery on an annual basis; seasonal or area differences in such incidental mortality or serious injury; and the rate.....of such incidental mortality or serious injury, etc., and (5 & 6) categorize the stock and estimate its potential biological removal levels (PBR).

Section 118 addresses taking of marine mammals incidental to commercial fishing operations. The two most prominent features of this section's required capabilities are to maintain a list of fisheries that describes the level of marine mammal interactions and to conduct "take reduction teams" for strategic stocks whose fishing mortality exceeds their potential biological removal level. How these teams are conducted is also specifically described in the Act, including team composition, duration of planning, and the use of a consensus-based negotiation process. This section instructs that Congress's ultimate goal is to reduce incidental mortality due to commercial fishing to levels approaching a "zero mortality rate". Thus, this section adds a number of administrative and analytical requirements to the scientific information discussed in the paragraphs above, that describes species status and population impacts. Additional analytical responsibilities include modeling to assess management strategies proposed by the teams and fishing gear technology testing. Administrative capabilities beyond take reduction team support include registration of fishermen participating in fisheries with high or occasional takes of marine mammals, a self-reporting process, and monitoring through observer coverage.

Section 301 and 302 of the MMPA establish the international dolphin conservation program. The Secretary is required to seek a binding international agreement in partnership with the Secretary of State with commitments to progressively reduce the take to approaching a zero mortality rate, from a maximum of five thousand animals at the start of the program. A per-stock, per-year dolphin mortality limit between 0.2 % and 0.1% of the minimum population estimate through 2000 and then less than 0.1% starting in 2001. Scientific status reviews are required periodically to check on progress toward these goals. These requirements exceed domestic needs in terms of certainty. As this involves agreement with other countries that has the potential to reduce economic returns, the science behind the estimation of dolphin population status and estimates of takes has come under intense scrutiny.

Sections 401, 402, 404, and 407 of the MMPA are the mandated capabilities of a marine mammal health and stranding response program. Data collection and dissemination requirements include the daily work of voluntary stranding response teams encompassing both the Atlantic and Pacific coastlines. Section 402 establishes stranding network responsibilities, the issuance of criteria related to determinations for rescue, rehabilitation, and release of stranded animals. Specifically the MMPA requires the Secretary to: (1) facilitate collection and dissemination of reference data on health of marine mammals and their health trends worldwide, (2) correlate health of marine mammals and marine mammal populations in the wild, with available data on physical, chemical and biological environmental parameters, (3) collect and periodically update

data on rescue and rehabilitation, on a species by species basis, to determine when an animal can be returned to wild, collect, preserve, tissues for physical chemical and biological analyses, regional strandings by numbers, regional stranding by conditions, regional stranding by causes of illness and deaths and comparison of illness and deaths with physical, chemical, and biological environmental parameters.

Managing the stranding network requires Agency human resources in each regional office and some science centers to respond to daily maintenance and emergency needs of the stranding network, with coordination through the national office.

Section 404 is specific to unusual mortality event response, requiring analysis of unusually large or uncharacteristic stranding events and development of a response plan. Information and management needs are broad: 1) determine whether an unusual event is occurring, 2) determine when response no longer necessary, and 3) develop a contingency plan to assist Secretary in responding. These 3 requirements envision the following additional capabilities: information to develop criteria for types of tissues and analyses needed, information on care techniques and affects to minimize deaths and provide appropriate care, numbers, size, sex information to analyze effects on affected populations and physical, chemical, and biological data, including contaminants. The final aspect of stranding response is the requirement for maintenance of a tissue bank in Section 407. This was envisioned to allow for tissue availability in future years when science has advanced further and analytical work can be continued. Congress recently appropriated stranding network funds through the Prescott Grant Program, primarily to support the volunteer organization's daily operations, such as facilities and equipment, although does retain some provision for limited scientific work. This program has been instrumental in furthering response capability by the network. However, since the program was limited to small grants out of a large appropriation, the administration by NOAA has been difficult as the human resources required to conduct this grant process exceed available funding.

APPENDIX II

Protected Species Stock Assessment Improvement Plan Questionnaire

Contacts:
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Objectives of this exercise:

The overall objective of this questionnaire is to provide information from the perspective of Science Center staff regarding how NMFS Protected Species stock assessments can be improved, and more specifically:

I. To identify the most important factors hampering our ability to provide accurate, precise, valid, and credible stock assessments as well as information on seasonal distribution and abundance of marine turtles and mammals;

II. To determine the resources (e.g. marine mammal and turtle survey data collection programs; data collection programs for fishery statistics; hire additional stock assessment scientific staff; hire additional NMFS staff such as survey personnel, technicians, database managers, computer programmers; obtain for ship/aircraft time) needed to improve our ability to develop credible assessments.

III. To determine how such needs vary by region;

IV. To use such information to develop specific proposals for new or expanded research programs, additional staff (including specific information on where, when and how many are needed), and other budget initiatives, if NMFS determines that such would be beneficial.

The questionnaire is primarily directed at stock assessment scientists (those who use and/or develop stock assessments), because stock assessment scientists should have a good overview of the primary deficiencies, if any, in the input data and/or models used for individual stock assessments. A second questionnaire will be directed towards stock assessment program managers, either at the level of Division Chief or Branch Chief – whichever is best suited to give an overview of each Center's assessment programs, which will depend on how each Center structures its assessment group(s).

The questionnaire should not be overly burdensome for assessment scientists or program managers to answer, nor for the Stock Assessment Improvement Plan Task Force to compile and summarize. Therefore, we have made use of multiple choice or lists of factors to rank or score in importance, with opportunities to provide additional information if respondents so desire. Please provide notes in the space provided at the end of each question (or on separate pieces of paper if you have a lot to say) whenever you feel that your answers require explanation or caveats. Responses will be seen by the members of the Task Force, but will not be circulated beyond that group.

Respondent's name:_____

Science Center/ Laboratory _____

Stocks/species for which answers to this questionnaire are provided. List all species/stocks, or at least specify the number covered by the relevant Stock Assessment Reports, for which you are providing answers here. If you deal with assessments of multiple stocks with distinctly different assessment needs, consider filling out separate questionnaires (or at least annotate this questionnaire to indicate the different assessment needs):

_____

_____

_____

_____

_____

_____

1. Identify the degree of improvement needed in the components of your species' Stock Assessment using the following ranking criteria (*please use a rank no more than twice*):

1 = major impediment to producing credible assessments and high priority for improvement
2 = major impediment to producing credible assessments, but not amongst the highest priorities
3 = current design is OK for accuracy of results, but increased sampling needed for better precision
4 = relatively minor fine-tuning needed
5 = current program adequate for assessment needs with no real need for improvement or expansion
6 = unknown (i.e., subject areas for which you do not feel confident commenting upon)

____ Determination of stock size (e.g., N_{min})
____ Determination of current population trend
____ Determination of population's intrinsic rate of increase (e.g., R_{max})
____ Determination of other life history characteristics (e.g., natality rates, survival, etc)
____ Use of recovery factors
____ Calculation of PBR or allowed incidental take
____ Mortality assessment
____ Other (specify) _____
____ Other (specify) _____

Comments: _____

_____

_____

_____

_____

2. Identify the programmatic needs of your current data collection and assessment programs that require additional funds using the following ranking criteria (*please use a rank no more than twice*):

1 = major impediment to producing credible assessments and high priority for improvement
2 = major impediment to producing credible assessments, but not amongst the highest priorities
3 = current design is OK for accuracy of results, but increased sampling needed for better precision
4 = relatively minor fine-tuning needed
5 = current program adequate for assessment needs with no real need for improvement or expansion
6 = unknown (i.e., subject areas for which you do not feel confident commenting upon)

____ Directed abundance surveys for assessments
____ Index surveys as surrogates for abundance surveys
____ Land based surveys of the abundance of some component of the stock
____ Directed surveys for seasonal estimates of seasonal abundance and distribution
____ Data on stock or population life history characteristics (e.g., age structure, natality rates,
____ Fine-scale temporal and spatial data for regulatory analyses
____ Studies for g(0) corrections, distribution, movements, etc
____ Fishery-dependent catch estimation for bycatch (e.g. by observer programs)
____ Data from other sources on fishery bycatch (e.g., strandings data)
____ Biological data (age, sex) on bycaught animals
____ Estimates of fishery effort
____ Data on other human-related mortality (e.g., ship strike, harvests, etc)
____ Stock structure
____ Other (specify) _____
____ Other (specify) _____

(Note: consider adequacy of sampling design and data collection protocols for each of the above).

Comments: _____

_____

_____

_____

3. Rank the following in terms of importance to the assessment of the species or species groups that you work on:

1 = major impediment to producing credible assessments and high priority for improvement
2 = major impediment to producing credible assessments, but not amongst the highest priorities
3 = current design is OK for accuracy of results, but increased sampling needed for better precision
4 = relatively minor fine-tuning needed
5 = current program adequate for assessment needs with no real need for improvement or expansion
6 = unknown (i.e., subject areas for which you do not feel confident commenting upon)

___ Quality of abundance surveys for assessments
___ Quality of index surveys as surrogates for abundance surveys
___ Quality of land based surveys of the abundance of some component of the stock
___ Quality of seasonal abundance and distribution data
___ Quality of data on basic biological parameters (age, sex, natality)
___ Quality of data for g(0) corrections, distribution, movements, etc
___ Quality of commercial by-catch data (fishery dependent or stranding)
___ Quality of basic biological parameters of bycaught animals (age, sex)
___ Quality of commercial fishing effort data
___ Quality of data on other anthropogenic mortality
___ Quality of data on stock structure
___ Quality of research on environmental effects
___ Quality of research on multispecies interactions
___ Quantity or quality of resource survey staff to collect necessary data
___ Quantity or quality of database managers and computer programmers to pre-process the data
___ Quantity or quality of assessment scientists to crank out assessments
___ Quantity or quality of assessment scientists to develop better survey and assessment methods
___ Quantity or quality of assessment scientists to study habitat associations
___ Quantity or quality of training for assessment scientists to improve skills
___ Quantity or quality of assessment scientists or other appropriate staff to communicate results to constituents (e.g., Expert Working Groups, Scientific Review Groups, Take Reduction Teams), and to conduct other follow-up work related to evaluation of Section 7 reviews, court cases, etc.
___ Quantity or quality of survey platforms (i.e., ships and aircraft)
___ Quantity or quality of survey equipment (e.g., passive acoustic arrays)
___ Other (specify) _____
___ Other (specify) _____

Comments: _____

_____

_____

_____

4. Regarding your "survey" data collection program, rank the following in terms of their impact on your ability to assess the species for which this response is being prepared (*within a topic area, please use a rank no more than twice*):

1 = would greatly enhance the ability to produce accurate, precise and timely assessments
2 = would help enhance the ability to produce accurate, precise and timely assessments but is of secondary importance
3 = may marginally improve the accuracy, precision or timeliness of assessments
4 = would not help or is irrelevant to these species
5 = unknown (i.e., subject areas for which you do not feel confident commenting upon)

Sampling frequency for **transect** surveys
___ More frequent "annual" assessment surveys
___ Increased sampling density within a survey
___ Seasonal distribution and abundance studies
___ Statistical analysis of sampling design

Use of acoustics in surveys
___ Research into the use of acoustics to improve surveys
___ Operational deployment of towed acoustic arrays and analysis of results
___ Operational deployment of moored or fixed arrays and analysis of results

Mark and recapture studies
___ Funding for systematic mark and recapture studies
___ Research into methods to improve mark and recapture studies
___ More frequent sampling events
___ Increased sampling sites
___ Improved coordination/standardization of sampling among sites
___ Statistical analysis of sampling design

Tagging efforts
___ Directed funding for g(0) corrections (e.g. dive time studies for cetaceans, hauling out for pinnipeds)
___ Deployments to study distribution and movements (wide and fine scale)
___ Funding for general instrument development (e.g., archival tags, satellite tags, GPS tags, etc)
___ Tag retention studies
___ Tag recovery studies

Development of survey tools
___ Satellite imagery
___ LIDAR
___ Acoustics,
___ High resolution vertical imagery
___ "Critter Cams"
___ Other _____

Development of software for surveys and analyses:

___ For recording observations during surveys
___ For incorporation of multiple data streams during surveys (e.g., survey observations, acoustics, oceanographic data)
___ Software to analyze survey results
___ Software to analyze the multiple data streams
___ Integration of full capabilities of GIS in evaluation of survey data
___ Other _____

_____

Staffing:

___ Staff to manage incoming data reporting and data processing requirements.
___ Staff to analyze biological data collections (e.g. age determinations, food habits analysis, stock ID)
___ Dedicated GIS support

___ Other (specify) _____
___ Other (specify) _____

Comments: _____

_____

_____

_____

5. Regarding the collection of data on mortalities of marine mammals and turtles, rank the following in terms of their impact on your ability to assess the species for which this response is being prepared (*please use a rank no more than three times*):

1= would greatly enhance the ability to produce accurate, precise and timely assessments
2= would help enhance the ability to produce accurate, precise and timely assessments but is of secondary importance
3= may marginally improve the accuracy, precision or timeliness of assessments
4= would not help or is irrelevant to these species
5= unknown (i.e., subject areas for which you do not feel confident commenting upon):

___ Implementation or expansion of fisheries observer program
___ Implementation or expansion of stranding monitoring program
___ Integration of health assessment into stranding programs
___ Implementation or expansion of log book reporting system
___ Implementation or expansion of reporting system for other human-related mortalities
___ Quantity or quality of staff to manage incoming data reporting and data processing requirements.
___ Quantity or quality of staff to analyze biological data collections (e.g. age determinations, food habits analysis)
___ Quantity or quality of staff to estimate mortalities
___ Statistical analysis of sampling design
___ Mandatory reporting of key effort statistics (e.g., horsepower, gear configuration, hours fished, haul set and haul back locations etc.)
___ Analysis of accuracy and statistical properties of effort and economic data
___ Other (specify) _____
___ Other (specify) _____

Comments:_____

_____

_____

_____

6. Approximately what percentage of your time (roughly averaged over the last two years) is spent in the following activities:

___ In the field participating in surveys
___ Other (field or related) research to improve stock assessments
___ Other fieldwork or research
___ The mechanics of stock assessments
___ Modeling research to improve stock assessment methodology
___ Participation in data collection or data management activities
___ Provision of scientific advice to Regional Offices, Review Groups, Councils and others
___ Participation in Section 7 reviews, evaluation of the consequences of alternative management strategies, and other Council-related activities
___ Other interactions with constituents
___ Professional development (writing papers, reading journals, attending conferences, training, etc.)
___ Administrative activities
___ Other (specify) _____
___ Other (specify) _____

Comments: _____

_____

_____

_____

7. What do you think would be the ideal percentage allocation of time (averaged across a group of stock assessment scientists, recognizing that there may be some degree of specialization between individuals) spent in the following activities:

___ In the field participating in surveys
___ Other (field or related) research to improve stock assessments
___ Other fieldwork or research
___ The mechanics of stock assessments
___ Modeling research to improve stock assessment methodology
___ Participation in data collection or data management activities
___ Provision of scientific advice to Regional Offices, Review Groups, Councils and others
___ Participation in Section 7 reviews, evaluation of the consequences of alternative management strategies, and other Council-related activities
___ Other interactions with constituents
___ Professional development (writing papers, reading journals, attending conferences, training, etc., for those of you who've forgotten what this is),
___ Administrative activities
___ Other (specify) _____
___ Other (specify) _____

Comments: _____

_____

_____

_____

8. What types of additional training/professional development opportunities would best help you meet present or future assessment challenges:

Training

____ Statistical methods
____ Survey methods
____ GIS analyses
____ Programming or software use
____ Project management
____ People management

____Assistance with advanced course work
____Additional travel to conferences
____ Special interest workshops designed to exchange information on specific stock assessment techniques
____Other (specify) _____
____Other (specify) _____

List specific courses, training, or development desired:_____

_____

_____

_____

APPENDIX III

Responses to the Protected Species Stock Assessment Improvement Program Needs Questionnaire

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
1. Identify the degree of improvement needed in the components of your species "Stock Assessment"						
Determination of stock size (e.g., Nmin)	3.3	1.3	1.7	2.5	3.5	2.5
Determination of current population trend	3.3	2.7	2.3	2.0	2.5	2.6
Determination of population's intrinsic rate of increase (e.g., Rmax)	4.2	2.0	1.7	2.5	3.0	2.7
Determination of other life history characteristics (e.g., natality rates, survival, etc)	2.8	1.3	1.7	2.5	5.0	2.7
Use of recovery factors	4.6	2.7	5.7	3.5	2.0	3.7
Calculation of PBR or allowed incidental take	4.2	3.7	4.0	1.0	5.0	3.6
Mortality assessment	3.0	1.7	3.7	3.5	2.0	2.8
Stock structure	2.3	1.7	3.0	3.5	1.0	2.3
2. Identify the programmatic needs of your current data collection and assessment programs that require additional funds						
Directed abundance surveys for assessments	3.3	1.7	1.0	2.5	3.5	2.4
Index surveys as surrogates for abundance surveys	4.1	4.0	4.5	2.0	2.0	3.3
Land based surveys of the abundance of some component of the stock	4.5	4.7	5.5	4.5	6.0	5.0
Directed surveys for seasonal estimates of seasonal abundance and distribution	3.2	1.7	1.5	2.5	4.0	2.6
Data on stock or population life history characteristics (e.g., age structure, natality rates,	2.7	2.3	3.0	2.5	4.0	2.9
Data on individual or population dispersal/migration	2.8	4.3	2.5	2.5	1.0	2.6
Fine-scale temporal and spatial data for regulatory analyses	3.2	4.3	2.5	3.0	3.0	3.2
Studies for g(0) corrections, distribution, movements, etc	3.9	2.7	2.5	6.0	1.5	3.3

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
Fishery-dependent catch estimation for bycatch (e.g. by observer programs)	3.8	1.3	2.5	2.5	1.0	2.2
Data from other sources on fishery bycatch (e.g., strandings data)	4.1	4.0	5.5	5.0	2.0	4.1
Biological data (age, sex) on bycaught animals	5.0	3.7	4.0	2.0	5.0	3.9
Estimates of fishery effort	4.8	2.3	3.0	5.0	3.0	3.6
Data on other human-related mortality (e.g., ship strike, harvests, etc)	3.6	3.7	3.0	5.5	3.0	3.8
Stock structure	2.8	2.0	4.0	4.5	1.0	2.9
3. Rank the following in terms of importance to the assessment of the species or species groups that you work on						
Quality of abundance surveys for assessments	3.3	1.7	1.0	2.5	1.5	2.0
Quality of index surveys as surrogates for abundance surveys	3.9	3.0	4.0	2.0	2.0	3.0
Quality of land based surveys of the abundance of some component of the stock	4.2	4.0	5.0	4.0	3.0	4.0
Quality of seasonal abundance and distribution data	2.5	2.3	2.5	3.0	2.5	2.6
Quality of stock or population demographics data (age, sex, natality)	2.6	1.3	2.5	3.0	4.0	2.7
Quality of data for g(0) corrections, distribution, movements, etc	3.1	2.0	2.0	5.5	2.0	2.9
Quality of commercial by-catch data (fishery dependent or stranding)	4.7	1.3	3.0	2.0	1.0	2.4
Quality of basic biological parameters of bycaught animals (age, sex)	5.1	3.0	4.0	2.5	3.0	3.5
Quality of commercial fishing effort data	5.4	1.7	3.0	4.5	3.0	3.5
Quality of data on other anthropogenic mortality	4.2	3.3	4.0	2.5	4.0	3.6

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
Quality of data on stock structure	2.7	1.7	4.0	3.0	1.0	2.5
Quality of research on environmental effects	2.5	2.7	5.5	2.0	3.0	3.1
Quality of research on multispecies interactions	3.2	4.0	5.5	2.0	4.0	3.7
Quantity or quality of resource survey staff to collect necessary data	3.2	2.3	3.5	2.0	2.0	2.6
Quantity or quality of database managers and computer programmers to pre-process the data	3.1	3.7	5.0	2.5	5.0	3.9
Quantity or quality of assessment scientists to crank out assessments	3.6	3.3	4.0	1.5	2.0	2.9
Quantity or quality of assessment scientists to develop better survey and assessment methods	4.0	3.7	4.0	1.5	1.0	2.8
Quantity or quality of assessment scientists to study habitat associations	3.8	4.0	4.5	2.5	5.0	4.0
Quantity or quality of training for assessment scientists to improve skills	4.3	5.3	4.5	2.0	4.0	4.0
Quantity or quality of assessment scientists or other appropriate staff to communicate results to	4.8	4.3	4.5	3.0	5.0	4.3
Quantity or quality of survey platforms (i.e., ships and aircraft)	3.6	3.0	5.5	3.0	1.0	3.2
Quantity or quality of survey equipment (e.g., passive acoustic arrays)	4.8	4.7	4.5	4.5	2.0	4.1
4. Regarding your ""survey"" data collection program, rank the following in terms of their impact on your ability to assess the species for which this response is being prepared						
Sampling frequency for transect surveys						
More frequent ""annual"" assessment surveys	2.3	2.3	2.5	2.0	1.0	2.0
Increased sampling density within a survey	3.5	4.0	2.0	2.5	2.0	2.8
Seasonal distribution and abundance studies	2.3	2.0	2.0	2.0	2.0	2.1
Statistical analysis of sampling design	2.6	2.7	2.5	1.5	3.0	2.5

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
Use of acoustics in surveys						
Research into the use of acoustics to improve surveys	3.0	3.0	2.5	4.0	1.0	2.7
Operational deployment of towed acoustic arrays and analysis of results	3.7	3.7	2.5	4.0	2.0	3.2
Operational deployment of moored or fixed arrays and analysis of results	3.1	4.5	3.5	4.0	1.0	3.2
Mark and recapture studies						
Funding for systematic mark and recapture studies	1.9	3.0	1.5	2.5	1.0	2.0
Research into methods to improve mark and recapture studies	3.5	4.0	1.0	3.0	3.0	2.9
More frequent sampling events	3.0	3.5	3.0	2.5	2.0	2.8
Increased sampling sites	2.8	3.0	3.0	2.0	2.0	2.6
Improved coordination/standardization of sampling among sites	3.4	3.5	3.5	3.0	1.0	2.9
Statistical analysis of sampling design	3.3	4.0	2.0	3.0	2.0	2.9
Tagging efforts						
Directed funding for g(0) corrections (e.g. dive time studies for cetaceans, hauling out for	2.1	1.0	4.0	3.0	2.5	2.5
Deployments to study distribution and movements (wide and fine scale)	1.8	2.3	1.0	1.5	1.0	1.5
Funding for general instrument development (e.g., archival tags, satellite tags, GPS tags, etc)	2.1	3.3	1.5	1.5	1.0	1.9
Tag retention studies	3.2	2.7	4.5	3.5	2.0	3.2
Tag recovery studies	3.3	3.0	4.5	3.5	2.0	3.3
Development of survey tools						

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
Satellite imagery	2.5	3.0	3.5	3.0	2.0	2.8
LIDAR	4.3	4.3	5.0	5.0	5.0	4.7
Acoustics,	3.4	3.3	3.0	4.0	1.0	3.0
High resolution vertical imagery	2.8	3.3	3.5	4.0	2.0	3.1
""Critter Cams""	3.3	3.7	4.5	1.5	3.0	3.2
Development of software for surveys and analyses:						
For recording observations during surveys	3.2	2.7	3.0	2.5	3.0	2.9
For incorporation of multiple data streams during surveys (e.g., survey observations, acoustics,	2.6	2.3	3.0	3.0	4.0	3.0
Software to analyze survey results	3.6	3.7	3.0	2.0	3.0	3.1
Software to analyze the multiple data streams	3.5	4.0	3.5	3.5	4.0	3.7
Integration of full capabilities of GIS in evaluation of survey data	1.9	2.0	4.0	1.5	5.0	2.9
Survey Resources						
Ship time in general	2.3	3.0	2.5	1.0	1.0	2.0
Availability of properly designed ships (quiet, adequate observing stations, etc)	3.0	3.3	4.0	1.5	1.0	2.6
Aircraft time in general	1.7	2.0	2.0	1.5	2.0	1.8
Availability of properly configured or designed aircraft (size, range, equipoment5, proper	2.3	2.0	4.0	2.0	2.0	2.5
Staffing:						
Staff to manage incoming data reporting and data processing requirements.	1.6	1.7	3.5	2.0	1.5	2.1
Staff to analyze biological data collections (e.g. age determinations, food habits analysis, stock id)	2.1	2.0	4.5	1.0	1.0	2.1

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
Dedicated GIS support	2.3	1.7	4.0	2.0	3.0	2.6
5. Regarding the collection of data on mortalities of marine mammals and turtles, rank the following in terms of their impact on your ability to assess the species for which this response is being prepared						
Implementation or expansion of fisheries observer program	3.3	1.0	2.0	1.5	1.0	1.8
Implementation or expansion of stranding monitoring program	3.5	3.0	2.5	2.5	5.0	3.3
Integration of health assessment into stranding programs	3.9	1.7	3.0	4.0	5.0	3.5
Implementation or expansion of log book reporting system	4.2	4.3	3.0	2.0	4.0	3.5
Implementation or expansion of reporting system for other human-related mortalities	3.5	2.7	4.0	3.0	5.0	3.6
Quantity or quality of staff to manage incoming data reporting and data processing requirements.	3.0	1.7	5.0	2.0	3.0	2.9
Quantity or quality of staff to analyze biological data collections (e.g. age determinations, food habits analysis)	3.3	3.0	5.0	1.0	3.0	3.1
Quantity or quality of staff to estimate mortalities	3.3	1.3	3.5	1.5	2.5	2.4
Statistical analysis of sampling design	3.9	2.3	4.0	1.5	2.0	2.8
Mandatory reporting of key effort statistics (e.g., horsepower, gear configuration, hours fished, haul set and haul back locations etc.)	3.9	3.0	3.0	2.0	1.0	2.6
Analysis of accuracy and statistical properties of effort and economic data	4.0	1.0	3.5	4.0	2.0	2.9
6. Approximately what percentage of your time (roughly averaged over the last two years) is spent in the following activities:						
In the field participating in surveys	6.1	10.3	15.0	4.0	11.5	9.4
Other (field or related) research to improve stock assessments	3.6	1.7	0.0	0.0	0.0	1.0
Other fieldwork or research	5.3	8.3	0.0	11.0	7.0	6.3
The mechanics of stock assessments	7.1	1.7	20.0	7.5	7.5	8.8
Modeling research to improve stock assessment methodology	5.3	5.7	5.0	3.5	30.0	9.9

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
Participation in data collection or data management activities	8.0	10.7	15.0	5.0	5.0	8.7
Provision of scientific advice to Regional Offices, Review Groups, Councils and others	5.3	15.0	40.0	15.0	9.0	16.9
Participation in Section 7 reviews, evaluation of the consequences of alternative management strategies, and other Council-related activities	6.7	9.3	0.0	17.5	0.0	6.7
Other interactions with constituents	5.9	5.0	0.0	0.5	5.0	3.3
Professional development (writing papers, reading journals, attending conferences, training, etc.)	19.4	16.7	0.0	10.5	17.5	12.8
Administrative activities	25.0	15.7	5.0	25.5	7.5	15.7
7. What do you think would be the ideal percentage allocation of time (averaged across a group of stock assessment scientists, recognizing that there may be some degree of specialization between individuals) spent in the following activities						
In the field participating in surveys	9.0	8.3	15.0	6.5	10.0	9.8
Other (field or related) research to improve stock assessments	9.0	10.0	0.0	2.5	15.0	7.3
Other fieldwork or research	3.0	3.3	0.0	0.0	5.0	2.3
The mechanics of stock assessments	12.0	3.3	20.0	7.5	10.0	10.6
Modeling research to improve stock assessment methodology	11.8	25.0	30.0	11.0	10.0	17.6
Participation in data collection or data management activities	9.8	5.0	0.0	15.0	10.0	8.0
Provision of scientific advice to Regional Offices, Review Groups, Councils and others	6.6	9.0	15.0	5.0	7.5	8.6
Participation in Section 7 reviews, evaluation of the consequences of alternative management strategies, and other Council-related activities	6.6	1.7	0.0	5.0	7.5	4.2
Other interactions with constituents	3.6	5.0	0.0	2.5	5.0	3.2
Professional development (writing papers, reading journals, attending conferences, training, etc.)	22.6	25.0	20.0	35.0	15.0	23.5
Administrative activities	6.0	4.3	0.0	10.0	5.0	5.1

TOPIC	AFSC	NEFSC	SEFSC	PIFSC	SWFSC	MEAN
8. What types of additional training/professional development opportunities would best help you meet present or future assessment challenges						
Training						
Statistical methods	1.7	2.0	1.0	1.5	1.5	1.5
Survey methods	3.1	2.7	1.5	2.5	1.5	2.3
GIS analyses in general	2.8	3.0	2.5	2.0	3.0	2.7
GIS analyses focused on marine or assessment analyses	2.4	2.3	2.5	2.0	3.0	2.4
Programming or software use	2.5	3.0	3.0	3.0	1.5	2.6
Project management	2.3	1.7	3.5	3.0	2.0	2.5
People management	2.7	2.0	3.5	3.5	2.0	2.7
Assistance with advanced course work	3.2	4.0	2.5	1.5	3.0	2.8
Additional travel to conferences	2.8	3.3	2.0	3.0	2.0	2.6
Special interest workshops designed to exchange information on specific stock assessment techniques	1.5	1.7	1.0	2.0	1.0	1.4