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NOAA TECHNICAL MEMORANDUM
NMFS-SEFSC-406

Report from the Scientific Peer Review of the SEFSC Marine Mammal Research Program, December 11-13, 1996

by

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National Oceanic and Atmospheric Administration
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ABSTRACT

The Southeast Fisheries Science Center (SEFSC) convened an independent, expert panel on December 11-13, 1996 to conduct a scientific peer-review of the activities its Marine Mammal Research Program (MMRP) conducted during 1989-1996, and make recommendations and establish priorities for future research on marine mammals in southeast regional waters. Staff of the MMRP presented a background of the program and discussed the variety of factors, such as the several unusual mortality events of bottlenose dolphins which have occurred in the region since 1987, recommendations from a review of the program in 1989, and new mandates and funding resulting from amendments to the Marine Mammal Protection Act, which have had major impacts in determining the research activities conducted by the program. Staff from the MMRP and collaborators provided overviews of the research activities, much of which was directed at assessing abundance of coastal bottlenose dolphin stocks through a combination of large-scale aerial survey and small-scale, site-specific studies, but which also included significant efforts to estimate the abundance of pelagic cetaceans in the northern Gulf of Mexico. The panel met privately following the conclusion of the presentations by the staff, and developed a set of prioritized recommendations it determined were necessary to improve the overall quality of research conducted by the program. The panel identified three areas of notable performance and expertise in the program: life history analysis, response to stranding events, and survey capability. The panel also noted that the MMRP has developed and supported intensive programs to assess many aspects of the biology of bottlenose dolphins in specific coastal areas, and the panel strongly supported the continuation of these efforts. One of the major findings of the panel was that while the research needs were not substantially less than those in the other NMFS regions, the levels of staffing and funding for program were, and that this has significantly compromised the effectiveness of the program. The panel noted that this has resulted in the lack of a coherent vision for the program, an insufficient number of peer-reviewed publications, insufficient time for program staff to interact with NMFS and non-NMFS counterparts, and insufficient diversity of expertise within the program to meet NMFS needs. The panel's highest priority recommendation was to expand the senior level staff through the addition of a coordinator, a large whale biologist, and a quantitative ecologist. The panel also provided numerous, specific recommendations for research activities it determined the MMRP should continue, expand, or initiate.

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REPORT FROM THE MEETING

I. INTRODUCTION

The Southeast Fisheries Science Center (SEFSC) conducted a review of its Marine Mammal Research Program (MMRP) to obtain an independent perspective with regard to recommendations and priorities for future research on marine mammals in southeast regional waters. Following a previous peer-review held in 1989 (Scott and Hansen 1989), the SEFSC began utilizing a combination of periodic, large-scale, regional aerial surveys and annual, small-scale, low-level/site-specific monitoring studies (mainly photo-identification) for assessments of bottlenose dolphins. The regional surveys have been used to periodically estimate abundance of all stocks of bottlenose dolphins while the site-specific studies have been used to produce annual abundance estimates of specific stocks of bottlenose dolphins at these sites. A critical issue with regard to this program review is whether or not either or both approaches are adequate given the 1994 amendments to the Marine Mammal Protection Act which require a new approach to managing marine mammal populations.

The invited members of the Review Panel (the Panel) comprised a) non-SEFSC staff representing the other NMFS Science Centers and the Office of Protected Resources, b) the Marine Mammal Commission, and c) academic and research institutions (Appendix I). The meeting was structured as a series of informal presentations with open discussion during and after each presentation (Appendix II). This report is intended to reflect a brief summary of the background information presented and the discussion on each topic, as well as to provide germane background on the SEFSC MMRP. Recommendations by the Panel are reflected throughout this report in the context in which those recommendations were made. In addition, they have been listed more succinctly in a memorandum from the Panel to the Directors of the SEFSC and the Office of Protected Resources (Appendix III).

I.A. BACKGROUND

The SEFSC consists of six Laboratories; three located along the coast of the northern Gulf of Mexico, and three along the Atlantic coast of the southeastern U.S. which are responsible for conducting research on marine resources within the Exclusive Economic Zone of the Southeast Region (Figure 1). The MMRP was initiated in 1978, primarily to provide information for establishing quotas for the then-active live-capture fishery for bottlenose dolphins (Scott 1990).

I.A.1. *Geographic Mandate and Common Species*

The geographic mandate comprises three bodies of water: the U.S. Atlantic Ocean south of the Virginia - North Carolina border; the U.S. Gulf of Mexico (the area approximately north of a line from Key West, Florida, to Brownsville, Texas); and U.S. Caribbean Sea (waters surrounding Puerto Rico and the U.S. Virgin Islands). Except for an occasional stray pinniped from the north, the only marine mammals under NMFS jurisdiction in southeast regional waters are cetaceans.

Studies to date indicate that the bottlenose dolphin and Atlantic spotted dolphin are the only small cetacean species that regularly inhabit the continental shelf (waters <200 m deep) near the mainland; the continental shelf along the southeastern U.S. is generally very wide compared to other regions of the

U.S. Bottlenose dolphins inhabit the more inshore and nearshore waters whereas Atlantic spotted dolphins generally are further offshore. Harbor porpoise occur near the coast of North Carolina during the winter. The cetacean community that regularly inhabits the oceanic waters (>200 m deep) of this region is tropical and consists of at least 18 species (*e.g.*, Bryde's whale, sperm whale, dwarf sperm whale, Cuvier's beaked whale, melon-headed whale, Risso's dolphin, pantropical spotted dolphin). Endangered species that inhabit southeastern U.S. waters are the sperm whale (a year-round inhabitant), the right whale, and humpback whale. In the winter right whales inhabit the nearshore waters of Georgia and eastern Florida. Humpback whales outside of the Caribbean (where they mate and calve) occur primarily during the winter in coastal waters of the Atlantic and, less frequently, Gulf of Mexico.

I.A.2. *Human Resources*

Within the SEFSC there are currently three full-time permanent senior level research staff dedicated to marine mammal research (at Beaufort, Charleston and Pascagoula) and three full-time permanent technical support staff (at Miami and Pascagoula). In addition, each laboratory, even those without dedicated marine mammal staff, have identified personnel to respond to strandings. The total full-time equivalent marine mammal staff at the SEFSC is currently about 15-17 FTEs, including permanent, temporary, and contract employees, and those with intermittent marine mammal tasks. About 30-40% of these FTEs are dedicated to stranding response or related activities. Several key marine mammal research activities are staffed with temporary or contract employees.

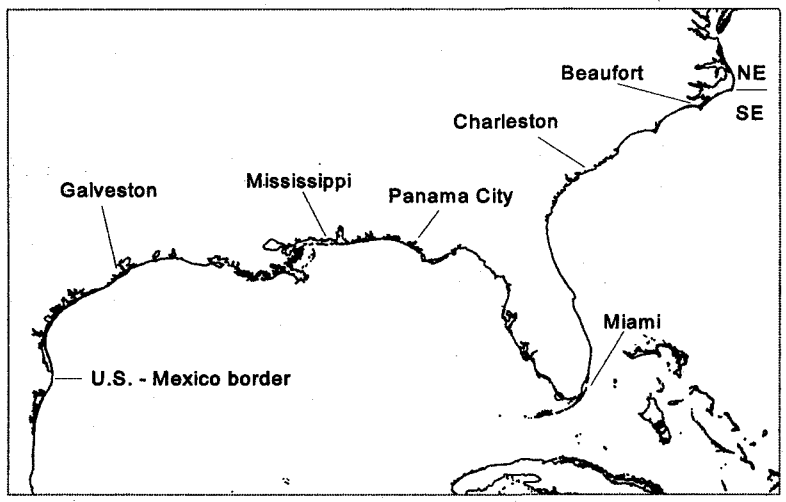

Figure 1

The MMRP manager is located at the Miami Laboratory; the manager is responsible for oversight and coordination of marine mammal research throughout the SEFSC.

I.A.3. *Funding*

Funding for the MMRP increased significantly in 1992, and has ranged from about $1.5 million to slightly over $2.0 million during 1992-1997 (Figure 2). The recent increase in base funds reflects the reassignment of personnel or redirection of funds to marine mammal activities, not an addition of new funds to base. Concomitant detailed information on spending was not available. The Panel noted that such information is

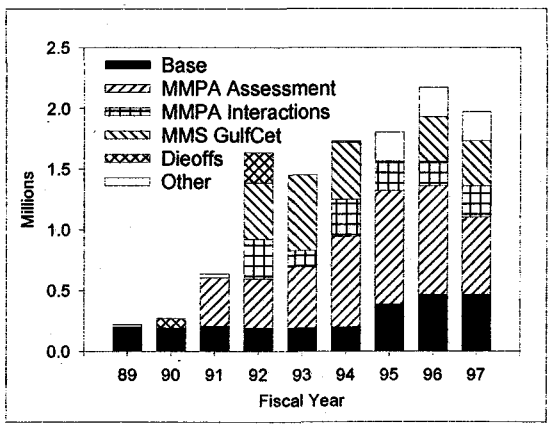

Figure 2. MMRP funding by fiscal year.

needed to conduct a thorough review and future programs reviews, for all the Centers, should include a spending summary.

An increasingly important source of funds has been those allocated and dispersed under the MMPA for targeted activities, particularly on assessment and fishery interactions. Some members of the Panel expressed uncertainty about the role of this Panel's recommendations as they relate to those of the NMFS internal MMPA/ESA Marine Mammal Funding Panel, which effectively ultimately determines research priorities as a result of funding decisions. Members of the Marine Mammal Funding Panel also present at this Review indicated a belief that recommendations from this group will be vital in identifying high priority projects for consideration for funding with the MMPA/ESA assessment funds.

Panel members also asked about the source of funding for research conducted to comply with the Marine Mammal Health and Stranding Response Act (see Long-Term Research section). Prior to FY96, there was a Congressional line item appropriation for the tissue bank. Beginning in FY97, funds are from other sources internal to the Office of Protected Resources (F/PR). According to F/PR, the intent is to solicit proposals in these program areas and hold a review similar to that conducted during the assessment funds process.

I.B. FACTORS INFLUENCING ACTIVITIES OF THE SEFSC MARINE MAMMAL PROGRAM FROM 1989-1996

A previous review of the marine mammal program, held in 1989, and a series of events since that review focussed the research directions of MMRP over the past 7 years. These events include other reviews, workshops, bottlenose dolphin dieoffs, and legislative changes. The Minerals Management Service (MMS) held a workshop in August, 1989 to review the information needs and recommend research approaches for assessing the impacts of offshore oil and gas development on sea turtles and marine mammals in the Gulf of Mexico (Tucker & Assoc. 1990). Unusual mortality events (dieoffs) of bottlenose dolphins in the Gulf of Mexico in 1990 and 1992 focussed attention and some research activities on determining the causes and impacts of these dieoffs (Colbert *et al. sumitted*, Hansen 1992a). The dieoffs also resulted in a temporary, if not permanent, cessation of the live-capture fishery for bottlenose dolphins in the southeastern U.S. In addition, recognition of difficulties which impeded the investigation of the 1990 dieoff resulted in significant efforts by the MMRP to improve various capabilities of the regional stranding network (Hansen 1992b, Staff 1991). Mandated requirements of the Endangered Species Act (ESA) resulted in interagency agreements with the MMS, which provided funding for research on pelagic cetaceans in the Gulf of Mexico. The reauthorization of the Marine Mammal Protection Act (MMPA) in 1988 and 1994 led to new demands for estimates of abundance and of human-induced mortality of all marine mammal stocks in U.S. waters, along with appropriations to fund research directed at obtaining these estimates. The Marine Mammal Health and Stranding Response Act of 1992 and the Recover Protected Species Initiative of NOAA's Strategic Plan also influenced research directions of the MMRP.

Larry Hansen summarized for the Panel the outcome of the previous Program Review and the other events that have influenced the conduct and priorities of the MMRP from 1989-1996, as follows.

I.B.1. *Marine Mammal Program Review, 1989*

Research activities of the MMRP from its inception through 1989 were reviewed at a workshop in May, 1989 (Scott and Hansen 1989). Recommendations from that review have, to a large degree, influenced the research directions of the MMRP since that time. The majority of those recommendations pertained to bottlenose dolphins because the species is ubiquitous in the Southeast Region, occurring offshore, along the coast, and in all embayments and estuarine waters including tidal rivers and creeks. Hence, it is the marine mammal species most likely to be impacted by human activities. The highest priority recommendations on bottlenose dolphins were:

1) Further development of data sets for monitoring bottlenose dolphins, through a combination of annual site-specific studies (primarily local, photo-identification based studies) supplemented by regional sampling with aerial surveys on a 3-5 year interval;

2) Evaluation of the utility of stranding network data for monitoring bottlenose dolphin stock status.

In following these recommendations, the MMRP directed significant resources to conduct site-specific studies (*e.g.*, Wells *et al.* 1996a and 1996b) and regional aerial surveys (Blaylock and Hoggard 1994), and to improve and fully utilize data collected by the regional stranding network (Staff 1991, Blaylock 1993-1996). Other recommendations for research on bottlenose dolphins included: determining stock structure (particularly local stock differentiation and inshore/offshore stocks), estimating fishery mortality, improving assessments by fully analyzing available data sets and incorporating vital-rate data from Sarasota Bay studies, further investigating impacts of the 1987-88 dieoff, and improving and better supporting stranding network activities. The MMRP also placed a high priority on these recommendations.

For right whales, the highest priority recommendations for research were to: 1) determine when, where, and how many right whales are present and calve in areas off the coasts of North Carolina, South Carolina, Georgia, and eastern Florida; and 2) complete development of an image processing system for right whale photographic data. The Northeast Fisheries Science Center (NEFSC) historically has taken the lead in right whale research. The MMRP passed these recommendations on to the NEFSC marine mammal staff and has worked cooperatively with them.

Another high priority recommendation was to conduct research directed at identifying populations of endangered cetaceans that possibly could be affected by oil and gas exploration in the Gulf of Mexico. The MMRP has conducted, in cooperation with the MMS, a significant amount of research on this topic.

I.B.2. *Minerals Management Service Workshop and Interagency Agreements*

Recommendations from the MMS workshop, held in August 1989 focussed on, but were not restricted to, research needs for determining the impacts of offshore oil and gas development on sea turtles and marine mammals in the Gulf of Mexico. Recommended research activities covered a broad range of topics. Emphasis was placed on conducting synoptic surveys of the entire Gulf of Mexico designed to provide adequate baseline and long-term monitoring data for assessing the impacts of human activities on marine mammals and their habitat. Other recommendations included: determine and monitor contaminant levels in marine mammals, determine levels of takes in fishery interactions, expand efforts to determine and monitor demography and dynamics of local bottlenose dolphin stocks, complete

research on bottlenose dolphin stock structure, and improve the marine mammal stranding network. Many of these recommendations were similar to those developed by the MMRP workshop, and the SEFSC has conducted many studies which met the objectives or intent of these recommendations.

The MMRP has conducted several research projects directed at providing information for evaluating the potential impacts of oil and gas development-related activities on marine mammals in the offshore waters of the northern Gulf of Mexico. Some small-scale, short-term projects were conducted in 1988-1989 (Lohoefener *et al.* 1990, Mullin *et al.* 1991b, Mullin *et al.* 1994) that led to more significant projects later. In 1991 the MMRP, in collaboration with Texas A&M University (TAMU) and with partial funding support from the MMS, began a 39-month study of the distribution and abundance of cetaceans in the slope waters of the north-central and western Gulf of Mexico (Davis and Fargion 1996). In 1996, a similar study was initiated, also in collaboration with TAMU and with partial funding support from the MMS, in the slope waters of the northeastern Gulf of Mexico. These studies compliment other large-scale surveys of marine mammal abundance and distribution in the Gulf of Mexico conducted by the MMRP (*e.g.*, Hansen *et al.* 1995).

I.B.3. *Unusual Mortality Events*

The investigation of the dieoff of bottlenose dolphins in the northern Gulf of Mexico during 1990 was impeded by a lack of consistent baseline information and the inability to detect and monitor unusual mortality events in close to real-time (Hansen 1992b). As a direct result of these problems, the MMRP implemented a major effort to improve the overall performance of the Stranding Network in the southeastern U.S. (Staff 1991). This effort was initiated in the spring of 1991, and involved: 1) establishment of a near real-time reporting system for monitoring the stranding rate, with the goal of detecting unusual mortality events; 2) establishment and dissemination of data collection standards, education of Network participants through necropsy and data collection workshops, and transfer of collected samples to appropriate facilities for analyses (*e.g.*, histopathology and virology), and; 3) to improve communication, establishment of a quarterly newsletter to disseminate results and other pertinent information to the Network. The SEFSC committed staff at each of the six SEFSC laboratories to serve as Area Representatives to a sub-region of the Network, with the primary goal of forwarding all reports of strandings to a centralized electronic database within 48 hours after the stranding was documented. Area representatives also worked with their respective Network participants to identify problems, distribute sample collection materials, transfer samples for analyses, and arrange for and conduct training workshops. The MMRP began publishing the quarterly newsletter *Strandings* in 1993; this newsletter has been instrumental in improving and maintaining the overall quality of data collection activities and the enthusiasm of Network participants.

The real-time monitoring system was critical for identifying and monitoring an unusual mortality event of bottlenose dolphins along the Texas coast in 1992 (Colbert *et al. sumitted*). Although the cause or causes of this dieoff were not determined, the investigation resulted in a new research direction for the MMRP. Because of the frequency of dieoffs along the Texas coast, wild, presumably healthy live animals were examined to determine if any predisposing conditions existed that may have contributed to the dieoffs (Sweeney 1992). This study lead to a research project designed to assess the relative health status of coastal bottlenose dolphin stocks (*e.g.*, Hansen and Wells 1996), ideally to identify stocks at greater risk of decline in productivity due to indirect, human-induced causes.

The Marine Mammal Health and Stranding Response Act of 1992 was enacted primarily in reaction to the unusual mortality events involving bottlenose dolphins in the Southeast Region which occurred during 1987-1992. The improvements that the MMRP made to the stranding network, and the on-going investigations of relative health of bottlenose dolphin stocks meet some of the requirements or intentions of this act.

I.B.4. *The MMPA and the Atlantic Scientific Review Group*

The reauthorization of and amendments to the Marine Mammal Protection Act in 1988 and 1994 resulted in requirements that the NMFS conduct research on marine mammals in U.S. waters necessary to produce estimates of stock size, human-induced mortality, and estimates of take levels that will not cause a stock to decline below Optimum Sustainable Population levels or impede recovery of depleted, threatened, or endangered stocks[1]. Annual funding has been appropriated by Congress to allow the NMFS to address these new requirements. Beginning in 1991, the MMRP has received a portion of these funds to address these requirements in the Southeast Region (Figure 2). The MMRP, with additional funding provided through interagency agreements with MMS, was able to produce the required estimates of abundance for the northern Gulf of Mexico (Blaylock and Hoggard 1994, Hansen *et al.* 1995). Stocks in other areas of the Southeast Region, such as the U.S. Caribbean and the southeastern U.S. Atlantic have not been adequately assessed (Blaylock 1995, Blaylock *et al.* 1995, Hansen *et al.* 1994). Many proposals have been presented which addressed high-priority regional issues relative to coastal bottlenose dolphin stocks; however, these proposals have, in general, either not been funded or funded at levels significantly below that requested based on national priorities recommended by a NMFS internal MMPA/ESA Marine Mammal Funding Panel composed of representatives from NMFS Regions, Centers, and the Office of Protected Resources. Regardless, the MMRP has conducted or funded a number of studies with the funding provided in addition to those referenced above (*e.g.*, see Curry and Smith *in press,* Hansen and Wells 1996, McFee *et al.* 1996, Mullin 1995, O'Sullivan and Mullin 1997, Peterson and Hubard 1996, Read *et al.* 1995, Urian and Wells 1996, Würsig and Lynn 1996).

As required under the MMPA, the Atlantic Scientific Review Group (ASRG) was established in 1994 to provide an independent review of research activities conducted by the MMRP to address the mandated requirements of the MMPA. Prior to this Program Review, the ASRG had reviewed the MMRP's research activities during four semi-annual meetings, and provided a series of recommended research activities or directions it believed addressed high priority issues for marine mammals in the Southeast Region relative to the mandates of the MMPA. The recommended research activities covered a wide range of topics and are listed in the reports of the ASRG meetings[2]. Although the MMRP has been able to conduct some of the recommended research, other research activities deemed to be of the highest priority by the ASRG have been determined to be of lower priority at the national level and have been only partially funded or not funded at all.

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[1] For more information, see: Barlow, J., S.L. Swartz, T.C. Eagle and P.R. Wade. 1995. U.S. marine mammal stock assessments: Guidelines for preparation, background, and a summary of 1995 assessments. NOAA Technical Memorandum NMFS-OPR-6, 73pp.

[2] ASRG meeting reports are available from T. Eagle, NMFS Office of Protected Resources, 1315 East-West Highway, Silver Spring, MD 20910.

I.B.5. *Recover Protected Species Initiative of NOAA's Strategic Plan*

The Recover Protected Species Initiative consists of the following: 1) promote the recovery of currently depleted species and take proactive steps to avoid depletion of species of concern; 2) complete assessments of all protected species; and 3) develop management strategies and technologies that will reduce the impact of interactions between protected species and resource users. These initiatives have been taken into account by the MMRP when research projects are developed and proposed, and the research activities of the MMRP have begun to provide the information required to address these initiatives.

I.C. PROCEDURAL RECOMMENDATIONS

Hansen proposed that the review be conducted by means of presentations on the topics and in the sequence suggested in the Agenda (Appendix II). Questions and comments on each topic would be appropriate during and following each presentation. At the completion of each larger issue area (e.g., coastal bottlenose dolphins, large whales) the Panel could generate a list of recommendations pertaining to that issue. After some deliberation, the Panel adopted this approach. Furthermore, it was agreed that the 16 members of the Panel would meet following the presentations and in a closed session to formulate final recommendations. The outcome of this closed session would be a prioritized set of recommendations to be forwarded to the Directors of the SEFSC and Office of Protected Resources accompanied by a memo summarizing the overall impression of the review and the marine mammal program (Appendix III).

I.D. CRITICAL ISSUES

Hansen suggested that critical issues within the SEFSC revolved around three primary areas: coastal bottlenose dolphins, right whales, and fishery interactions. Discussion arose over the definition of the term *critical issue.* The following definition was suggested: situations in which species have low abundance or no abundance estimate and likely or known human interactions. Alternatively, it was suggested that mandates and critical management issues should drive research objectives and priorities. For the southeast region, these issues here proposed include:

- *Tursiops* stock identification and determination of fisheries impacts;
- right whale mortality and disturbance;
- unusual mortality events;
- pollution/habitat degradation;
- harassment and disturbance; and
- offshore oil and gas development; pressure to open eastern Gulf of Mexico.

Additional critical issues noted in a round-table brainstorming session were:

- the need to focus on recovery of depleted stocks;
- collection of samples and data to contribute to management and develop of baseline data;
- collection of baseline natural history information;
- better use of data and understanding the source of mortality;
- coordination with other entities such as other agencies and research groups;
- response to unusual mortality events;
- the need to focus on other sources of human impacts rather than just fisheries;

- development of PBRs for all stocks;
- revision of the right whale recovery plan;
- development of classification criteria;
- evaluation of information needs for strategic stocks; and
- institution of a planning process.

A proactive approach was suggested to be as necessary as a reactive one. For example, the need for research on the possible impacts of coastal development and human population growth on marine mammal stocks was specifically mentioned. Contributing to a proactive approach would be analysis of existing data and samples collected through strandings, entanglements, or other activities to establish databases for future use on all species.

II. REVIEW OF RESEARCH CONDUCTED FROM 1989-PRESENT

II.A. COASTAL BOTTLENOSE DOLPHIN STOCKS

II.A.1. *Stock Assessment - Abundance*

II.A.1.a. Regional aerial surveys

In response to the 1989 review, the MMRP initiated a rotational series of aerial line-transect sampling surveys in 1992 designed to produce abundance estimates of bottlenose dolphin stocks in coastal and continental shelf waters. Keith Mullin presented an overview of the surveys conducted in the Gulf of Mexico and Atlantic Ocean. The objectives of the surveys were to provide estimates of abundance for each stock for estimating potential biological removal (PBR) and for monitoring trends relative to optimal sustainable population size (OSP). All surveys were conducted using standard line-transect aerial survey methods. The program DISTANCE was used for data analyses (Laake *et al.* 1994).

For these surveys, the Southeast Region was stratified into four geographic areas (western, central and eastern Gulf of Mexico and the Atlantic coast). Surveys were designed to be conducted in a 4-year rotation with one area surveyed each year. Gulf surveys were designed to replicate a similar research effort conducted from 1983-86 (Scott *et al.* 1989). The Gulf of Mexico was surveyed during 1992-1994 (Blaylock and Hoggard 1994, Blaylock *et al.* 1995). A new Gulf series was started in 1996 and is planned to be completed in 1998. (The 1997 survey was canceled, see below.) The Atlantic surveys replicated a 1983 survey. The Atlantic coast was surveyed in 1991 (Blaylock and Hoggard 1994), censused in 1994 (Blaylock 1995), and surveyed in 1995. If the survey rotation is maintained, the Atlantic coast will be surveyed again in 1999.

Gulf surveys covered U.S. waters less than 100 fm. This area was divided into survey blocks based on three habitats: "bays" (including sounds and estuaries), the coastal zone (<10 fathoms), and the outer continental shelf (OCS, 10-100 fathoms). Effort was allocated to the three habitats differentially with more effort per unit area allocated to bays and coastal waters. The level of effort was such that abundance estimates with coefficients of variation (CVs) near 0.20 could be achieved. Estimates with that level of precision should allow for detecting 40-50% declines in abundance (*i.e.*, <OSP) with an 80% probability. Surveys were conducted in the fall, with one complete rotation occurring from 1992-1994. Based on conservative assumptions related to genetics, site-fidelity and adaptations to regional

oceanographic conditions, Gulf stocks were identified as follows: 33 bay, 3 coastal zone, 1 OCS, and 1 continental slope (estimated from vessel surveys). Preliminary analysis resulted in bay abundance estimates ranging from 0-1,401 dolphins with CVs generally above 0.35; the 33 bay stocks in the Gulf are strategic stocks. Effort would need to be increased in most embayments to improve the CVs. Coastal zone estimates ranged from 3,499-9,912 dolphins with CVs from 0.12-0.21 and the OCS estimate was 50,247 (CV = 0.26). Bottlenose dolphins inhabited and were widely distributed in every marine environment less than 100 fm in the Gulf of Mexico.

In the Atlantic, the Coastal Migratory Stock is listed as depleted. The stock has been thought to move north of Cape Hatteras, North Carolina, in summer and south of the Cape in winter. Two aerial surveys programs were implemented to study coastal Atlantic bottlenose dolphins. In order to monitor the abundance of all coastal bottlenose dolphins, Atlantic surveys were conducted in winter 1992 and 1995 from south of Cape Hatteras to Miami, Florida. The study area was from shore to 9 km offshore of the western wall of the Gulf Stream to replicate the survey conducted in 1983. In order to monitor the abundance of the Coastal Migratory Stock, surveys were conducted in summer from Cape Hatteras north to Sandy Hook, New Jersey, in 1994 and 1995. The study area extended from the shore out to the 25 m isobath. Preliminary estimates of abundance south of Cape Hatteras were 12,435 (CV = 0.18) and 21,128 (CV = 0.22) for 1992 and 1995, respectively. Animals were distributed throughout the study area. North of Cape Hatteras in summer, estimates were 25,841 (CV = 0.36) and 12,570 (CV = 0.19) for 1994 and 1995, respectively. Animals were more common in the southern half of the study area and nearer to shore. Because of unknown stock structure, in 1995 an along-shore survey was conducted to obtain a minimum count of animals that would comprise the Coastal Migratory Stock. The PBR of coastal Atlantic bottlenose dolphins, 25 dolphins, is based on the mean of three replicate of this count (N=2,482 dolphins).

No estimates of abundance have been made of bottlenose dolphins in the estuaries and embayments in the Atlantic. In the Gulf, these areas are surveyed routinely during the aerial surveys. Inasmuch as the regulatory definition of coastal migratory stock does not include estuarine animals, an abundance estimate from coastal surveys might suffice for this depleted stock. The Southeast Regional Office believes, however, that it is important to obtain abundance estimates for the bays and estuaries. The question still remains about the best way to obtain accurate and precise estimates of abundance in those areas.

Considerable discussion revolved around the interpretation of results from aerial surveys in the absence of knowledge of stock structure. Current stock structure of bottlenose dolphins in both the Atlantic and Gulf (bays, coastal waters, and OCS waters) is based primarily on sampling strata and/or geography and may have little basis in biological reality. Therefore studies to define the true stock structure both in the Atlantic and Gulf are imperative. Abundance estimates and PBRs should be based on those structures. In the meantime, it was suggested that Gulf non-bay stock structure be simplified (e.g., combine all coastal stocks into one, and combine the two offshore stocks into a single offshore stocks; or combine all non-estuarine stocks into one stock). These stocks are based on conservative assumptions concerning dolphins' adaptations to probable regional differences in habitat. The Review Panel suggested that these assumptions were probably overly conservative and that the stock structure could be simplified.

With FY96 funds, a new rotation for aerial surveys was begun and the western Gulf was surveyed in September 1996. A proposal for surveys of the central Gulf was rated highly during the September 1996 meeting of the NMFS internal MMPA/ESA Funding Panel of FY97 marine mammal proposals.

Nonetheless, while it was acknowledged that these surveys have been excellent in both design and implementation, the Review Panel recommended that they be discontinued until stock structure is defined. The time needed to define stock structure is not clear and could easily be 2 years or longer. The recommendation to discontinue aerial surveys implies that updated PBRs and abundance estimates relative to OSP based on current strata-based stock structure are of no use from a management standpoint. The central and eastern Gulf estimates will be 4 years old in 1997 and 1998, respectively. Keith Mullin stated that he does not agree with this view and the discontinuance of aerial surveys was not unanimous among others. It was noted by some Review Panel members that aerial surveys have value other than for abundance estimates, such as monitoring habitat preferences and changes.

Currently no corrections relative to g_0 and f_0 have been estimated for or applied to aerial survey data, suggesting that abundance is underestimated. In order to achieve estimates closer to absolute abundance and thus improved estimates of PBR, the experiments necessary to estimate these corrections must conducted.

Analyses of all aerial survey data are in the preliminary stages. A concerted effort needs to be made to finalize analyses of current data and compare results to previous estimates in a formal manner (*i.e.*, peer-reviewed literature); the Review Panel recommended that these analyses be conducted.

II.A.1.b. Site-specific monitoring

Low-level or site-specific monitoring studies of local bottlenose dolphin communities have been established at three sites along the northern coast of the Gulf of Mexico and at four sites along the southeastern U.S. Atlantic coast. The main objective of these studies has been to provide annual abundance estimates with sufficient precision to detect a halving or doubling in population size between years. The studies are founded primarily on photo-identification, and provide many types of information, including residency patterns, range, birth rates, mortality rates, and other important parameters. The Gulf of Mexico studies, funded by the MMRP since 1989 or earlier, are located in Texas, Mississippi, and the west coast of Florida (*e.g.*, Bräger 1992, Fertl 1994, Henningson 1991, Mullin and Hoggard 1992a and 1992b, Peterson and Hubard 1996, Wells *et al.* 1996a and 1996b, Würsig and Weller 1995). The Atlantic study sites are located along the Florida east coast (two sites), South Carolina, and North Carolina (*e.g.*, Caldwell 1996, Rittmaster and Thayer unpublished data, Zolman 1996). Although the North Carolina study was initiated around 1985, the MMRP did not begin funding this study until 1994. The Florida and South Carolina sites were initiated and funded beginning in 1994. Several of these studies are (or have been) in whole or part, conducted by graduate students.

Randall Wells presented results from Sarasota Bay and adjacent sites (Tampa Bay, Charlotte Harbor, Pine Island Sound) along the Gulf coast of Florida as an example of the potential information that can be obtained from site-specific monitoring of coastal bottlenose dolphins. These photographic identification studies can be used to detect interannual changes in abundance with better precision than has been demonstrated for shipboard or aerial surveys, and they establish a database of identifiable individual dolphins and their ranges, leading to assignment to geographically based local communities. Overall, 58-80% individuals can be identified by natural marks. Identified individuals can be monitored for stock identification (e.g., through site-fidelity and movement pattern data) and for fundamental aspects of life history. Capture-release efforts at low-level monitoring study sites provide supplementary data on age, sex, genetics, growth, reproductive condition, body condition, contaminant loads, and the opportunity to mark individuals that are otherwise non-distinctive. In Sarasota Bay, nearly all of the 100 resident

dolphins, of at least four generations, are readily recognizable, and more than 90% are of known age, sex, and/or genetic relationships. This level of knowledge, from more than 26 years of research, allows the calculation of empirically based vital rates, and the close tracking of these rates over time.

Site-specific monitoring projects in waters adjacent to Sarasota Bay have also found indications of long-term residency that enables a mark-recapture approach to abundance estimation. Consistent patterns of resighting within a limited area over multiple years suggest a geographical basis to management unit designations, based on records from many of the more than 2,000 identified dolphins. A mosaic of overlapping dolphin community home ranges appears to exist along the central west coast of Florida. Mark-recapture abundance estimates were stable for Tampa Bay over the six annual surveys. Estimates from Charlotte Harbor from five annual surveys suggested an increase in abundance, but critical uncertainties remain regarding the possible sources of the increase. For both sites, seasonal changes in abundance have been indicated by NMFS aerial surveys, but NMFS-sponsored photo-id studies have occurred only in one season each year. Documented rates of immigration and emigration are low, but shorter-term movements by a few individuals between their embayments and their associated dolphin communities may occur somewhat more frequently. Genetic exchange between communities is indicated by the results of preliminary paternity testing by Debbie Duffield, in which 40% of calves born to resident Sarasota females were found to have been sired by non-Sarasota males. More work is necessary to identify the relationships between communities of dolphins inhabiting adjacent embayments and to determine which bays or bay systems should be considered separate stocks. Understanding the ranging patterns of dolphins using the Gulf of Mexico coastal waters immediately offshore of these embayments may illuminate some of these relationships.

Wells showed that the cumulative frequency distribution of sightings leveled off after one year in a new site. When queried, he responded that the interpretation of this pattern of relatively few new individuals following the first year or so of effort is that of residency of dolphins at these sites. The data show some movement between sites, however. When asked about mating patterns, Wells responded that the reproductive peak is May-July and that animals could and do mate outside their resident embayment and then return after mating.

Questions regarding costs of setting up photo-id programs were raised during this presentation and the stock structure presentation. The cost depends on a number of factors: the size of the survey area, the desired level of survey effort, and the availability of cost-sharing measures. Wells indicated that his team attempts to survey each part of the study site at least 3-5 times during the course of an annual survey. In Sarasota, this may require only 3-5 days (with about 20-30% of the residents seen each day), while in Tampa Bay it may require up to five weeks, given weather constraints and the large survey area. Field experiments remain to be conducted to standardize experimental design to facilitate analyses. Along the west coast of Florida, the costs of annual surveys have ranged from $12,000 to $35,000. As a general rule, multi-year projects tend to be less expensive after the first year. Costs can be reduced by using students and volunteers, and in some cases it has ben possible to obtain matching funds from other organizations. Terry Henwood from the SEFSC Pascagoula Lab added that these studies can require hiring two people to conduct the survey, buying boats, and obtaining other gear and supplies and that the cost is greater than $40,000 annually. Aleta Hohn noted that for the stock program in the Atlantic costs per site ranges from $17,000 to $25,000 and depended on graduate students and cost sharing.

Suggestions for incorporating new technology and improved communication were expressed. Such systems as GIS allow the integration of databases on dolphins, environmental parameters, and human

activities (*i.e.*, boating). Computer programs are currently under development at Eckerd College and elsewhere to facilitate the identification of dolphins from fin photographs. Digital cameras may provide a new, cost-effective means of collecting fin images and converting them to computerized formats for analysis. The sharing of resulting identification information across research sites may be facilitated by Internet communication.

In a discussion of monitoring losses from a population, it was recognized that mortality and injury data are difficult to obtain. Much of the available information comes from the efforts of the volunteer stranding network. In Sarasota, about 50% of the dolphins that are lost from the population are recovered by the stranding network as carcasses. The individuals are recognized either from freeze brands or distinctive natural markings. In some cases, medical histories are available from the capture-release programs; these may aid in interpretation of cause of death. Fewer known animals are recovered from Tampa Bay, where the dolphin population, the geographic area to be covered, and the shark population are all larger.

Members of the Panel voiced concern over possible impacts of boating activities on dolphins. Increasing boat traffic in many parts of the southeastern U.S., the advent of personal watercraft that have no depth limitations, recent records of collisions between boats and dolphins, and the results of studies involving other species of cetaceans suggest that boats may impact local stocks. Wells indicated that as of October 1996 he has initiated a 2-year Earthwatch-sponsored survey to examine the relative distributions of boat activities and dolphins in Sarasota, but that behavioral and acoustic studies of disturbance responses remain to be done to fully evaluate the level of the threat to these animals.

Hansen, Hohn, and Mullin suggested that concurrent aerial and photo-id surveys might be conducted to address some of the weaknesses of aerial surveys in estuaries and embayments. Such an experiment, conducted at an existing monitoring site, might lead to the development of correction factors that would increase the potential value of aerial surveys.

The Panel also recommended that on-going volunteer "dolphin-watch" programs be investigated to determine whether they might be organized and coordinated to provide a cost-effective means for determining and monitoring the seasonal distribution and abundance of bottlenose dolphins in bays, estuaries, and nearshore areas along the Atlantic coast.

II.A.2. *Stock Assessment - Structure*

Hohn summarized current information on stock structure in the Gulf and Atlantic and discussed proposed research. The delineation of stocks of bottlenose dolphins in the southeast has two components: the distinction between inshore and offshore stocks and the distinction among inshore stocks. Morphometric and parasite load differences have long separated an inshore and offshore form. MMRP-sponsored research to differentiate onshore and offshore stocks primarily has been through genetic testing (Curry and Smith *in press*). In addition, samples and specimens are routinely provided to other institutions to pursue additional means of stock differentiation. In part from these samples, recent results from non-NMFS sponsored studies of stable isotope ratios and feeding habits also indicate distinct inshore and offshore forms. At question still is the distribution of inshore and offshore forms, the range of overlap of those distributions, and how the distribution patterns affect estimates of abundance, particularly of the inshore stock. The pelagic cetacean survey scheduled for 1998 in the Atlantic will be directed along track lines as close to the coast as feasible in order to allow for biopsy

sampling of bottlenose dolphins over a wide geographic area in the presumed range of overlap of inshore and offshore forms. Plans are being made to cover the remaining, more near-shore area using a small vessel to complement the sampling conducted during the pelagic survey. The Panel recommended that these small-vessel surveys be conducted to cover the area between the coast and the shallowest depths attainable from the larger shipboard surveys. Both sets of data and samples should help define the ranges of the inshore and offshore forms, at least during the season of the survey.

In the Gulf of Mexico, stock structure has been assumed for the purposes of estimating abundance (see previous section on Regional aerial surveys). The assumptions have been made using information from genetics (inshore-offshore), site-fidelity (inshore), and oceanographic patterns (nearshore and offshore). Site-specific monitoring studies in the Gulf have provided additional information on residency and migratory patterns at multiple sites along the Gulf coast as noted in the previous section.

In the inshore Atlantic, one stock has been formally recognized. This Coastal Migratory Stock was defined as a result of the listing of the stock as depleted following the dieoff event in 1987-88. Its limits were determined on the basis of the temporal and spatial pattern of the dieoff because there was no other information on which to characterize stock structure of the inshore bottlenose dolphins along the mid-Atlantic. It was recognized that resident estuarine stocks probably also exist; these were considered separate from the coastal migratory stock and excluded from the depletion listing. Recent results from photo-identification, morphometrics, stable isotopes ratios, and genetics suggest more than one coastal form and do not support a single, mixed population ranging from New Jersey to Florida (a single coastal migratory stock). Furthermore, the dieoff pattern is not inconsistent with the way epidemics spread, and it is possible that multiple stocks of coastal animals were affected with some groups affected more than others.

Possible alternative stock structure scenarios were presented. The hypothesized structure of one coastal migratory stock ranging from New Jersey to Florida is questionable. Dolphins in northern mid-Atlantic do show seasonal patterns, moving north to Virginia and New Jersey in the summer and south towards North Carolina in the winter months, tracking the die-off pattern in the summer and fall of 1987. But south of central North Carolina this pattern is not consistent. There seem to be resident groups with small home ranges, possibly multiple, contiguous, seasonally resident groups with larger home ranges, and groups with long-range migratory patterns. Hohn described a proposal that had been submitted, and funded for the first of three years, to define stock structure of mid-Atlantic bottlenose dolphins using these alternative stock scenarios as alternative hypotheses. The proposal includes the various methods that have been used successfully to date, including photo-id, morphometrics, isotope ratios analyses, genetics, or likely to be valuable tools, such as satellite telemetry. In addition the project was designed to allow for testing which method(s) will best and most efficiently resolve stock structure. Addressing this question depends on the analysis of matched samples (various tissues from an individual analyzed across the various methods) collected from entangled/stranded or live captured dolphins and the subsequent merging of the disassociated results for each animal. The proposal also includes a more comprehensive and standardized approach to photo-identification studies and the development of a coast-wide centralized photo-id catalogue.

The best information on stock structure to date has come from photo-identification studies, from the NMFS-funded site-specific monitoring studies (Jacksonville, FL, Charleston, SC, and Beaufort, NC) (Caldwell 1996, Rittmaster and Thayer unpubl. data, Zolman 1996) and from non-NMFS-funded independent researchers (Bull Creek, SC, Wilmington, NC, Virginia Beach, VA, and Cape May, NJ,) .

The combined information from these widely separated geographic sites has already provided invaluable insight into residency and movement patterns. There are, however, inconsistencies in the effort and techniques among the sites, in photo-id catalogue and database structure, and time dedicated matching fins within and between sites. SEFSC sponsored a workshop with the various investigators to attempt to standardize techniques (Urian and Wells 1997).

Cumulatively the extensive photo-id catalogues along the Atlantic coast provide the opportunity for large-scale results relatively quickly once a central photo-id catalogue is in place. In addition, establishing a cooperative (voluntary) agreement between collaborators to standardize their various methodologies is imperative, as most of these projects are or were not NMFS-funded and investigators could only be requested to contribute their data and photos. It was suggested that through the permit process mandatory coordination similar to that for humpback whale photo-id efforts could be required of these independent researchers. The majority sentiment of the Panel was that requiring participation in the central catalogue would be less palatable than soliciting cooperation. The need for using the existing data to obtain between-site matches and establishing a central photo-id catalogue was again emphasized. The FY97 proposal for a 3-yr project on stock structure in the mid-Atlantic, including setting up a central photo-id catalogue, was funded for the first year.

No definitive genetic studies have been conducted to evaluate differences within the inshore form. SEFSC-sponsored studies (e.g., Curry and Smith, *in press*) focussed on differences between the inshore and offshore form, although the haplotype variation in the Atlantic inshore form was greater than that in the Gulf inshore form. A previous study (Dowling and Brown 1993) found high levels of haplotype divergence along the Atlantic coast and suggested that at least three separate groups could be identified. The small sample sizes suggest that this analysis should be repeated but indications of separate groups of inshore bottlenose dolphins are consistent with some of the information from photo-id. The Panel asked about the source of samples used for genetic studies. In some cases the samples were obtained by means of biopsy and in other cases the samples were obtained from stranded animals. For stranded animals, the Panel was concerned that the specific "stock" of an animal is unknown, *i.e.*, whether it is part of the coastal migratory stock, a coastal resident, and estuarine form, or an offshore animal. The new (FY97) stock proposal proposes obtaining biopsy samples initially from individuals known through photo-id so that their residency patterns are known, to use samples from live captures, and to use samples from entangled specimens rather than those that stranded of other causes and may have wandered before stranding. This proposal includes a request for funding to have Patricia Rosel work at the Charleston lab as part of the overall stock project. She would use biopsy samples collected from inshore animals and from animals encountered during the pelagic surveys (these could be inshore or offshore animals). In addition, she would participate in the analysis of matched samples collected from individuals dolphins for concurrent analyses using genetics, isotope ratios, morphometrics, and contaminants loads.

There were many questions regarding use of the terms "inshore", "coastal", "estuarine", "offshore", "residents", and "transients", as well as their relationships to each other. For the time being, inshore means a composite of coastal and estuarine forms, as well as any other stocks identified to reside near to the coast, and offshore means residing further off the coast. The offshore stock is generally assumed to be the large form of bottlenose dolphin. Residents are not necessarily estuarine, and transients are not necessarily coastal. Some of the bottlenose dolphins tagged with VHF transmitters during the live-captures in Beaufort last summer went from the estuary onto the coast, suggesting the possibility that in at least some areas there is no clear dividing line keeping primarily estuarine animals from traveling along the coast or, conversely, preventing coastal animals from occasionally entering the estuaries. The

Panel asked, then, whether the coastal migratory stock might include estuarine animals. It is possible, particularly in the north, such as along the North Carolina coast. In the south, year-round estuarine residents have been found in several geographic locations and these may be essentially reproductively isolated from the coastal migratory stock. A goal of the stock structure project is to be able to identify and consistently define these various spatial/temporal patterns as they pertain to separate management stocks.

The Panel discussed the advantages and disadvantages of aerial surveys and site-specific monitoring studies. It was suggested that the techniques are complementary and that an experiment could be designed to use site-specific results about seasonal habitat use patterns and counts from small vessels to develop correction factors for estimates from aerial surveys. It was further suggested that the cost-benefits of this combined method be compared to small-boat biopsy sampling linked with photo-id. In other words, why not do rapid small-boat surveys of embayments and obtain biopsies and other information? The magnitude of the effort that would be required to sample every embayment on the East coast from small-boat surveys would be very large. Nonetheless, it was suggested that the probability of obtaining more and better information using this method might be greater than through aerial surveys, particularly where year-round estuarine residents are certain to occur, and it would be more cost effective. However, there was agreement that before such surveys are conducted, baseline data must be obtained and photo-id work might be the best way to begin. The use of satellite transmitters was also recommended as important. In the interim, there are no abundance estimates for estuarine or coastal dolphin stock and, therefore, it is not possible to estimate PBR and determine impacts of fisheries and other human activities on these stocks.

II.A.3. *Mortality Estimation*

II.A.3.a. Strandings

The Stranding Network has documented the strandings of 400-600 bottlenose dolphins annually over the past 10 years. Blair Mase presented an overview of the SE Region Stranding Network and how it has responded to this large number of strandings. Major milestones include implementation of training workshops, the development of an electronic, near-real-time data reporting system, establishment of the condition code protocol, and the publication of *Strandings*, the southeast regional stranding newsletter. The series of training workshops was conducted to educate Network members, most of whom are volunteers, in necropsy protocol and sample dissemination; information regarding species distribution, pathology, toxicology and life history is obtained through stranding response. Improvement in data collection and carcass evaluation has resulted in more cases where the cause(s) of death has been determined. Methods for identifying signs of fishery interactions in stranded animals have been standardized and Network participants have been trained in applying these methods; the percentage of stranded bottlenose dolphins that show indications of fishery interaction is at least 6-16% regionally and varies by State from less than 5% to more than 50%. The quarterly newsletter supplements the training by including articles on stranded specimens or the types of research being conducted and serves as an important means of communication and cohesion among network members.

The Panel asked about the procedures and personnel used to respond to strandings. There are currently 35 holders of a Letter of Authorization (a letter from NMFS that authorizes the holder to respond to strandings) in the Southeast. Many letter holders are private organizations and Universities. In addition, participation by State employees in stranding response is often significant; they do not require Letters.

The time to and quality of response of the Letter holders is variable. Most Letter holders consistently report strandings in a timely manner, whereas some consistently do not. Since Letter holders are volunteers, and requirements for Letters do not stipulate that stranding reports be sent to the Miami Lab within a specified time, ideally two days, it is hard to enforce prompt and consistent reporting. To encourage and facilitate timely and accurate stranding response and reporting, the workshops, the newsletter providing feedback and encouragement, field guides and adequate supplies (*e.g.,* ready-filled vials with formalin for tissue collection, film for photographs) are constantly provided.

Because so many of the respondents are volunteers, only the basic Level A data (sex, length, species) generally are collected. The Panel suggested making the collection of various kinds of data and tissues (life history, histopathology, morphometry, genetics, etc.) mandatory. Alternatively, they proposed that the newsletter could be used to promote "friendly competition" among volunteers in terms of the time and quality of their effort. Concerns about the quality of species identification by volunteers and how the Miami Lab verifies these reports were voiced. Volunteers usually submit photos of the specimen(s) and send them to the area Stranding Coordinators and to the Miami Lab. Identification of species is also facilitated by field guides used by volunteers and other voucher materials (*i.e.*, teeth, skulls) which are also collected. Other suggestions included the need for collection of more detailed data and more samples, especially for those species which are hard to identify or are rare *(i.e., Mesoplodon*). It was noted that due to the large number of individuals and species that strand in the southeast region the potential contribution to knowledge from all those specimens if full sets of data and samples being collected would be tremendous. The Panel suggested that SEFSC develop an inventory of samples available at each lab, as well as a tracking system indicating the dissemination of samples for research.

In addition to regular stranding response, the SEFSC has investigated several unusual mortality events of bottlenose dolphins (Hansen 1992a, Colbert *et al. submitted*) and played a key role in developing protocols for investigating these events of marine mammals. Unusual mortality events occurred in 1987-88 on the Atlantic Coast, 1990 in Galveston Bay, 1993 in the Eastern Gulf of Mexico, 1994 in the Western Gulf of Mexico, and 1996 in Mississippi. Unusual mortality event response, such as a recent one in Mississippi, is often facilitated through cooperation with universities and state agencies. An emergency team of in-house staff has been organized to respond to unusual mortality events.

James Tobias demonstrated the SEFSC Stranding Network near real-time reporting system implemented in 1991. This computerized system allows for direct field entry of stranding data to allow quick identification of possible unusual mortality events. The system flags events as "unusual" when mortality exceeds two standard deviations of the mean number of monthly strandings for an area; means exclude unusual events. Obvious "die-offs" are reported directly to the Miami Lab.

Concerns were raised regarding the identification of and response to unusual mortality events. The responsibility for initial identification of an unusual mortality event is with the Center, in this case the Miami Lab. When the possibility of such an event is evident, SEFSC staff notify the National Stranding Coordinator in F/PR. F/PR is then responsible for notifying the unusual mortality task force/working group. In theory, the Chair of the Unusual Mortality Task Force has 24-48 hours to get consensus from the working task force on whether an event qualifies as unusual and should be so designated. The response team has the authority once an unusual mortality event is identified to initiate the contingency plan which includes mobilizing people and resources as necessary. Unfortunately, sometimes this process takes a long time. In some circumstances, events turn out to be unusual and response would have benefitted from that designation if timely. Key concerns are the delay in communication and

failure to immediately collect water, sediment, and other environmental samples if subsequent analyses may be necessary to determine if environmental contamination could have caused or triggered the event.

A weakness in unusual mortality response is the lack of a early-event investigation protocol. In addition, the group has no funding authority. Regions or Labs often end up reprogramming funds to respond to mass mortality events. There would be stronger motivation to do immediate analyses (*i.e.*, of environmental parameters) with support of this type of response from this panel. Title IV of the MMPA has identified response to unusual mortality events as an item that may be funded by the public, and established an interest bearing fund (Marine Mammal Unusual Mortality Event Fund) in the Treasury. Without initial NOAA funding, however, solicitation of funds is difficult.

The Panel commended the SEFSC for the impressive improvements in the stranding network and recognized it as a strength for the Center.

II.A.3.b. Coastal Net Fisheries

The MMRP conducted two studies to estimate the level of fishery interactions in two coastal gillnet fisheries: the shark gillnet fishery and the shad gillnet fishery. The results of the shad gillnet study indicate that interactions with bottlenose dolphins were rare (none were observed) and an insignificant source of mortality (McFee *et al.* 1996). The shark gillnet study resulted in essentially the same conclusions; however, the ASRG raised some concerns relative to the observation methods and recommended further investigations of this fishery.

II.A.3.b.i. Coastal shark fisheries - South Carolina, Georgia, and Florida

John Carlson gave a brief description of two coastal shark fisheries. The shark set-net fishery was observed in 1992 along the South Carolina and Georgia coasts. This Category II fishery is carried out by small vessels located centrally along the coast. There are usually one or two fishermen per vessel, using a 20-33 cm stretch mesh gillnet anchored to the ground and often left unattended for long periods of time. This fishery is illegal in state waters. Fisherman have set up their own market and fish just enough to meet the specific demand from specific restaurants. The catch is landed in St. Mary's, GA, and is distributed from there. The shark driftnet fishery takes place in two primary areas: off Jacksonville, FL and off Cape Canaveral, FL. There are 6-11 vessels in this Category III fishery, all of which fish in the EEZ with nets with 12-28 stretch mesh size. By law, there must be an observer on board (to document fish taken, not marine mammals). Fishing effort varies from year to year.

No marine mammals have been observed caught in the driftnet fishery and only one dolphin has been observed in the set-net fishery. Carlson thought that bottlenose dolphins would be expected to be caught in these fisheries, remarking that he has seen lots of activity in the area, mostly involving shrimp trawls and bottlenose dolphins. He also noted that some of this fishery occurs in right whale habitat. There was one report of an injury to a whale calf, possibly due to this fishery, as well as anecdotal information about "whales" captured in this fishery at the same time as reports on calf fishery interaction. Further investigation is warranted.

Many questions focussed on the duties and conduct of the observers on the vessels. The observers collect shark data as well as marine mammal interaction data. However, due to the placement of the observer on board (the only place for observers is on a small platform forward of the nets and rollers due

to the small size of the boats), the observer would be unable to see any dolphins that fall out of the nets except directly alongside the vessel. The result is an inadequate program to observe marine mammal entanglements. It was suggested that perhaps observations should be made from independent vessels. The possibility of photographing the fishing operations from another vessel was also raised, but because this fishery takes place at night a red spotlight or night-spotting device would be needed. In addition, a large vessel capable of going offshore would be required.

There was some concern as to the source of funding for this observer program since the program is inadequate to collect marine mammal entanglement data. Funding was provided through the marine mammal appropriations. F/PR noted that they were aware of the problem and have discontinued funding. Until an adequate observer program has been implemented, any conclusion that no marine mammals are killed in these fisheries is premature.

II.A.3.b.ii. Shad fishery - South Carolina

Larry Hansen summarized research done with the shad fishery off the South Carolina coast which was monitored in a proactive effort to address fishery interaction problems before they became critical (see McFee *et al.* 1996). This was done because although this fishery is listed as Category III, there have been strandings coincident with the opening time of the fishery. This is a very seasonal (February to April) fishery, with nets set perpendicular to the shore and actively fished for about 7 hours during the day. These gillnets are 150 - 1800 m x 6 m with a stretch-mesh size of 5.5". There were no observers on board, but fishing activities were observed via other means. No marine mammal takes were seen; however, there were anecdotal reports of fishermen taking one dolphin per fisherman per lifetime in these nets. Although incidental take levels were low and primarily anecdotal, it was noted that the shad fishery extends farther north, and concerns about the possible correlation of bottlenose dolphins and harbor porpoise strandings with the start of the shad fishery up to Connecticut were expressed. The fact that this fishery, which occurs over a large area, was only monitored in a small area, suggests that these observations may not be too accurate, and should not be used to make generalizations. The panel recommended that this work be done with the NE Region, to see what data they have on this fishery and compare its classification in South Carolina to its classification elsewhere. This will perhaps lead to a reclassification of the fishery coast-wide. The Panel congratulated SEFSC/Charleston Lab for being proactive.

II.A.3.b.iii. Coastal net fisheries - North Carolina

Evidence from stranding data (Thayer and Rittmaster 1993) and restrictions on coastal fishing activity in much of the Southeast Region have resulted in North Carolina being the primary State for both coastal fishing effort and fishery mortality of bottlenose dolphins and harbor porpoises. Attempts to address this issue began in 1995 with a characterization of North Carolina net fisheries (Thayer and Montgomery 1996) and expanded in 1996 with an extensive evaluation of stranding records[3] and with more timely response to stranding events to better determine when strandings are due to human interactions.

[3] Progress report for MMPA funding, available from A.A. Hohn, Beaufort Laboratory, 101 Pivers Island Rd., Beaufort, NC 28516-9722.

Aleta Hohn presented data on the absolute and relative magnitude of fisheries interactions, as determined from strandings, along the coast of North Carolina. Human interactions are documented on a standard form developed for this purpose. In calculating percentage of beached animals involved in fisheries interactions, the number of animals with signs of interactions is noted as a function of the number of animals for which a carcass was or could be evaluated for interactions. Over half of the carcasses are too decomposed by the time a qualified individual can examine them or the carcass is not examined by someone with expertise in evaluating an animal for signs of interactions. Evidence suggests that takes in North Carolina alone exceed PBR for the coastal migratory stock of bottlenose dolphins. Since the depleted coastal migratory stock extends from New Jersey to Florida and takes are known from most of those States, total fishery mortality, even if based only on strandings, is likely to be high. The fisheries specifically involved are generally unknown but at least 34 fisheries occur in the waters of North Carolina. An observer program is planned using a beach-sampling program, complemented by observations of fishing vessels from independent small boats and aerial surveys to determine fishing effort and the distribution of nets.

Following the presentation of strandings and interaction data, a number of questions arose. Stranded animals are evaluated for cause of death. So, a healing wound, or scar, would not be recorded as a cause of death, *per se*, but an open prop wound might be. There are carcasses with more than one sign of interaction, and these are reported on the basis of category the most certain sign of human interaction. For example, severed flukes or slit abdomen would be given priority over net marks. Generally, a fishery cannot be identified from nets or gear marks on a carcass, but the type of line or net can be. When gear is found on carcasses it is kept. The mortality of bottlenose dolphins is roughly equal by sex but the age and reproductive structure of entangled animals has yet to be determined. The samples are available, however.

Hohn noted that the data show a significant difference in the condition (by Condition Code) of a carcass and the determination of human interaction. Only the most obvious signs of interaction (severed flukes) are detected on Condition 4 animals even when examined for signs of interaction. For Condition 2 and Condition 3 animals, the relative frequency of types of interaction are the same for the more obvious signs but the relative frequency of net marks, a generally more subtle sign, in Condition 3 animals is only half of that of Condition 2 animals. This suggests that even when care is taken to identify carcasses for sign of interactions we are underestimating interactions.

It was suggested that Condition 4 strandings might have died offshore, possibly in fisheries further from the beach and that is why they are so decomposed. In some cases, newly stranded carcasses are already decomposing. In other cases, it is a matter of how frequently the beaches are searched for new strandings or the weather condition. It doesn't take long on hot beaches for animals to decompose. Still, the problem remains that we don't know from where stranded animals originated. It was suggested that carcasses be tagged and re-floated to determine recovery patterns. In the sea-sampling program run by NEFSC for fisheries more than three miles from the beach off the coast of North Carolina and to the north, entangled cetaceans (including observed bottlenose dolphin takes) are tagged. The stranding network has not yet recovered any tagged animals in North Carolina. In the beach-sampling program proposed by SEFSC, the assumption is made that strandings occur close to the place of entanglement. This assumption may not be valid. The discussion went back to the point about tagging/recapturing the carcasses to obtain a correction factor for these estimates.

Although the central focus of this discussion was bottlenose dolphins, data were presented on harbor porpoise and humpback whale human interactions. For harbor porpoises in North Carolina, most carcasses have not been adequately evaluated for signs of human interaction because of the fast decomposition rate and the lack of qualified individuals in northern North Carolina, where porpoise strandings occur. In the broader mid-Atlantic region, however, the number of positively determined human interactions is high. Harbor porpoise have been observed taken in the dogfish gillnet fishery in the NEFSC sea sampling program. For humpback whales, a large number have stranded in recent years in the NC/VA area with many of these due to interactions. The humpbacks that strand in this region are usually between 25'-30'. A recommendation was made to more closely examine all humpbacks that strand in the mid-Atlantic region.

Data on fisheries and fishing licenses in North Carolina was briefly reviewed. The potential of fisheries which have been indigenous to the area to have affected stocks over an extended time was acknowledged. However, it was also noted that there may have been an increase in fishing effort recently because of fishing closures in other States. For example, New Englanders are also coming south to fish for dogfish. The need to characterize fisheries in North Carolina was strongly expressed.

Data do not exist on the precise location of fishing nets that would allow development of a database documenting fishing activity. Such information might be important in developing take reduction plans to mitigate entanglements. The Atlantic States Marine Fisheries Committee (ASMFC) is establishing an Atlantic coast-wide database to record bycatch (the primary reason for the program is fish bycatch) levels and fishing effort. However, funding has not yet been committed for the necessary observer program. When the program is in effect, the ASMFC has offered to work with us. That is at least two years away. It was noted that it is important to begin gathering take data immediately to address mid-Atlantic Take Reduction Team concerns.

Given the level of mortality determined from stranded bottlenose dolphins and the PBR for the coastal migratory stock, could NMFS close fisheries? It was thought yes because PBR has been exceeded in some years and approached in others using just stranding data and without the dedicated effort of an observer program. The mid-Atlantic TRT is scheduled to begin in January, but given the uncertainty of which fisheries are involved, the large geographic areas covered (since the coastal migratory stock, as defined, ranges from New Jersey to Florida and takes occur in most of those States), and the uncertainty about stock structure and abundance, SEFSC recommended to F/PR that the TRT not be convened for another year or two. Instead of starting the TRT meetings in January, SEFSC recommended setting up a plan to obtain the needed information within a designated time frame. F/PR agreed with this proposed approach and are willing to suggest it to the AA. However, it was also noted that the lawyers may advise the AA that the TRT be convened immediately.

It was noted that if the coastal bottlenose dolphin population abundance is as low as estimated, and the mortality is as high as some of the stranding data might suggest, the population might be extinct by now given the long history of coastal fisheries in the area. However, this mortality (or fishing effort) may not be a constant impact up and down the coast (dolphin density may not be constant, either). Furthermore, as noted above, effort in NC may have increased in recent years.

The new SEFSC beach-based observer program in the mid-Atlantic will attempt to obtain interaction data. Beach surveys will provide strandings/net relationships; boat monitoring will lead to direct observation of net hauls and retrieval and tagging of carcasses; aerial surveys will yield fishing effort,

spatiotemporal distribution of both fishing activities and strategic cetacean stocks, and the collection of other data on these strategic stocks. Eventually the distribution data can be put in a GIS system and may be useful for mitigating bycatch in the manner that the NEFSC has set-up for reducing harbor porpoise interactions by using environmental data to predict where takes of harbor porpoise might occur. It serves as a predictor to allow fishermen to change their fishing patterns without having to resort to fisheries closures. It was agreed that all three surveys (beach-based, small independent vessel, and aerial) are needed.

The Panel emphasized that it is critical to know which fisheries are taking marine mammals. The only sure way to do this is to observe net hauls. The observer program planned includes some observations by small independent boats of fishing activity and monitoring of hauls. The Panel suggested also observing hauls from the beach using spotting scopes. A similar program in California was successful for documenting sea otter mortality. The obvious problems of directly observing net hauls were discussed (*e.g.*, fishermen would haul their nets on the opposite side of the boat after they learned that they were being observed from the shore). In addition, it was suggested that the SEFSC make use of other avenues to obtain data and information (*i.e.*, ASMFC, mid-Atlantic Council). The importance of beginning data collection immediately was emphasized.

SEFSC needs to improve abundance estimates to get a better estimate of PBR and to determine stock structure. A new abundance estimate is essential, and although it would not include estuaries, it will help guide our thoughts about abundance and stock structure. Perhaps the easiest way to start this is to re-analyze existing data? These activities should be conducted concurrently with the observer program.

II.A.4. *Recovery and Conservation*

As a result of the 1987-88 dieoff that affected the mid-Atlantic coastal migratory stock of bottlenose dolphins, the stock was listed as depleted on April 6, 1993, following extensive discussions (*e.g.*, 18 May 1992 memo to N. Foster (F/PR) from D. DeMaster, S. Reilly, and G. Scott, and 20 January 1993 memo to M. Tillman (F/PR) from B. Brown). In September, 1993, the NMFS convened a workshop to compile existing information on this stock (Wang *et al.* 1994) as an initial step towards developing a Conservation Plan. From 1994-96, fishery interactions have been shown to be a significant source of mortality in the mid-Atlantic, as indicated by stranded dolphins. Means to reduce this bycatch to enhance recovery have been proposed.

Aleta Hohn noted that efforts are starting in Beaufort to determine whether density-compensatory responses can be detected in the depleted stock. By conducting longitudinal studies of females, some of which have been resighted since the photo-id catalogue began in 1985, and comparing those with results with reproductive and survival rates in Sarasota, it might be possible to observe factors that indicate density dependence. In addition, these results can be enhanced with calving intervals and age at maturation estimated from strandings.

The Panel asked about the status of the Conservation Plan. Section 115(b) of the MMPA specifies that conservation plans shall be prepared as soon as possible for any species or stock designated as depleted, unless it is determined that a conservation plan will not promote the conservation of the species or stock. The Southeast Regional Office (SER) representative, Kathy Wang, indicated that a preliminary draft conservation plan was prepared some time ago for the coastal migratory stock of bottlenose dolphins that had been designated as depleted, but that no target date had been set for completion of the plan. The

Panel recommended that the F/PR, the SER, and SEFSC work together to complete the plan as soon as possible. The panel also recommended that state agencies, universities, etc. that might help implement the plan be consulted during the preparation of the plan and, if appropriate, be asked to endorse the plan as has been done with the Florida Manatee Recovery Plan. It was recommended that the plan include criteria for determining when the stock has recovered and an estimate of the time to recovery in the absence of human-caused mortality and injury or another catastrophic event.

II.A.5. *Long-Term Research*

II.A.5.a. Health Assessment

The overall goal of the health assessment research is to develop methodology for identifying bottlenose dolphin stocks with relatively low or declining productivity due to indirect human-induced factors. The factors specifically targeted are industrial, agricultural and urban contaminants, some of which likely increase the mortality and decrease reproductive rate in bottlenose dolphin stocks which reside in heavily polluted nearshore and embayment habitats. Health assessment sampling was initiated in 1992 to evaluate the relative health of bottlenose dolphins in Matagorda Bay, Texas, following an unusual mortality event. The MMRP sponsored a workshop in 1993 to review the health assessment data from Matagorda Bay, and a similar but long-term data set from Sarasota Bay, Florida, and develop a quantitative model of dolphin health (Wells 1994). Preliminary evaluation of the model, which is based on blood parameters, indicates that the model is sensitive to seasonal variation in health as indicated by the frequency of strandings. Scores generated by the health model may also be an indicator of the effects of bio-accumulated contaminant loads; preliminary analyses indicate that animals with poorer health scores have larger contaminant loads (Reif *et al. in review*). Sampling of bottlenose dolphins in and around Beaufort, North Carolina, was conducted during 1996 (Hansen and Wells 1996); sample analyses are continuing. Additional health assessment sampling and other health assessment related projects on biomarkers of contaminant exposure and effects were proposed for MMPA funding in fiscal year 1997, but were viewed as low priority by the funding panel and not funded. Current efforts are focused on completing the analyses of the Beaufort samples, evaluating the variation of the parameters used in the model and developing criteria for estimating the precision of the model, and incorporating the full range of available parameters in the model (*e.g.*, diagnostic ultrasound, urinalysis, etc.). Future efforts will be directed at establishing regular sample collection activities throughout the Southeast Region to evaluate the health of localized bottlenose dolphin stocks.

Larry Hansen presented an overview of the health assessment research at the SEFSC. Health assessment is focussed on estuarine stocks of coastal bottlenose dolphins, since these stocks are those most likely to be negatively impacted by various sources of habitat degradation such as agricultural pollution and coastal development. Hansen presented data which showed relatively heavy application of agricultural pesticides in most estuarine watersheds in the Southeast Region, and that the highest "hazard-normalized" application rates were in North Carolina[4]. Some areas of the Region's coast are highly developed, but increased development is anticipated, and this will result more industrial and urban pollution in the estuarine environment. In addition to localized impacts, much of the pollution which impacts the Region's estuarine waters is from non-point sources. For instance, the Mississippi River drains approximately 60% of the continental U.S., and delivers urban, industrial, and agricultural

[4] For more information, see Pait, A.S., A.E. DeSouza and D.R.G. Farrow. 1992. Agricultural pesticide use in coastal areas: A national summary. NOAA, NOS, Strategic Environmental Assessments Div., Rockville, MD. 112pp.

contaminants from that area into the Gulf of Mexico. The recent, frequent nature of dieoffs of bottlenose dolphins in the Southeast Region also may indicate that habitat degradation is a factor in dolphin mortality. A basic assumption of health assessment is that the impacts of habitat degradation will result in measurable effects on overall health of dolphin stocks.

Behind the concept of need for health assessment is the acknowledgment that indirect sources may also contribute to declines or lack of recovery in marine mammal populations by reducing fecundity or increasing mortality, which would be expected in stocks with lower health. Low impact factors can have minor, chronic effects on populations in the near-term, but potentially catastrophic effects in the long-term. Some preliminary models shown by Hansen demonstrated possible effects of even a small decrease in either survival or productivity that would not be detected by conventional methods because the rate of decline is too slow but could reduce population viability catastrophically in the long term. Controversy arose because several members of the panel thought that overlaying an assumed density-dependent function on a density-independent factor skews the results and over states the impacts demonstrated, or that the effects of environmental contaminants would be density dependent such that the affected populations would stabilize at some level, rather than decline to extinction. Other panel members argued that the effects were likely to be density independent such that the model results were not unrealistic. There was some agreement that density independent decreases in survival and productivity caused by environmental contaminants would be indicative, in conceptual terms, of a decrease in carrying capacity and that certain contaminants could cause carrying capacity to effectively be reduced to zero. Regardless of problems with the preliminary models, the point was made that current population assessment methods are not sensitive to low rates of population change and that the goal of health assessment is to use additional parameters to identify stocks with relatively lower overall health. The assumption is that there is a direct relationship between health and survival and productivity, and that lower health results in lower survival and productivity.

Concerns arose over how to determine the exact effect of a toxicant level on a particular individual (*i.e.*, reduced fecundity, increased mortality). Should NMFS care only if contaminants cause such effects or is there a responsibility to try to maintain healthy populations with individuals in good condition? The latter reflects OSP-type management approaches, which have shown to not be successful in court, which is why NMFS developed PBR for MMPA Title 1 issues. But, it was noted that NMFS has obligations under Title 4 as well which requires that NMFS assess the health of marine mammal stocks.

Hansen noted the need to approach this topic from the perspective of risk-assessment strategies to address contaminant level mitigation or management, the same approach used for people. The panel suggested that the only way to validate this approach would be to track animals, in an area such as Sarasota Bay, over time to determine cause-effect relationships. The Panel also noted that it would be possible to identify and, to a certain extent, assess and predict risks using cellular models and other indirect indicators (*e.g.*, biomarkers). Efforts are now being made to develop a framework for incorporating health assessment, experimental, and environmental data into a mathematical risk-assessment model. Such a model can be used to assign a level of probability of risk (in this case, risk of decline in survival and/or productivity) to a sampled stock.

It was asked how much variation exists between species and whether models developed for one species can be applied to another. In labs, animals are submitted to tests using large doses of one chemical. However, free-ranging animals are subjected to small doses of many contaminants throughout their

lifetime. Also, we are more interested in the effects of chemicals on populations, not on individuals, so the risk assessment procedure may be more appropriate in this case.

There are two necessary components for this: (1) a cross-section of the population (strandings and epidemiology), and (2) longitudinal data of individuals over time (*e.g.*, Sarasota) to examine for effects. The resulting management would be on a population or stock level.

PBR-based management is based on the assumptions that population declines (or failure to recover) are due to human-caused mortality and that declining or depleted populations will equilibrate at or above their maximum net productivity level if known human-caused mortalities are kept below the estimated PBR level. If this is true, then risk assessment would fit in with PBR. It was suggested that SEFSC think about the future to develop a database to deal with expected problems. Longitudinal studies and other site-specific work may provide the means for deciding future questions. Not everything NMFS does is driven by PBR. For example, Title 4 mandates that we get baseline data and contaminant levels. But NMFS needs to have solid data to defend.

Health assessment sampling has been conducted in three areas in the Southeast Region. One-time sampling occurred in Matagorda Bay, TX, in the summer of 1992 following a localized unusual mortality event there a few months earlier. Similar sampling activities were conducted in Beaufort, NC, during the summer of 1995. Analysis of all the Matagorda samples has been completed and health scores were generated; analysis of the Beaufort samples is complete with the exception of teeth for age estimation, which is required before health scores can be computed. Longitudinal health assessment sampling has been conducted in Sarasota Bay, FL, at least annually during 1985-1994. Data from all three areas will be used in developing the risk assessment model.

Hansen reviewed the results of a workshop held in 1993 to develop a quantitative model for dolphin health based on blood chemistry and hematology (Wells, 1994). The workshop relied on published information, expert dolphin veterinarians, an epidemiologist and others to develop a weighted scoring algorithm using 19 blood parameters. The parameters were weighted by degree of importance, and some parameters were age and sex dependent. The higher the score, the worse the condition of the animal. A mean score for a certain stock could be developed, facilitating comparison between "areas" or stocks. It was stated that a mean score for a stock would be an assumption because stock structure has not been defined to be other than one continuous coastal migratory stock. The health score that was developed may reflect the impacts of contaminants on health; a statistical analysis of contaminant loads in blubber and health scores showed that animals with poorer health scores had significantly higher levels of DDEs and PCBs than animals with better health scores (Reif *et al. in review*).

Randy Wells presented data from Sarasota that indicated there may be a relationship between the health scores and mortality. Animals were found to be in better health in the winter than in the summer, however, there was some discrepancy with regard to the sample sizes used to make this statement (winter $n = 15$, summer $n = 150$), and animals used in this talk were not sampled in both winter and summer. Sampling was done at the two temperature extremes during the year (late June and late January-early February). Between these two times, there is approximately a 40°F temperature difference. The question of whether the health score correlated with mortality was asked. The response was yes, because strandings occur more often in the summer than in winter. In individual dolphins, their mass grows from summer to winter, with a 30% increase in blubber depth. Data collected in Sarasota generally supported the health score system presented by Hansen.

The panel also made the following comments:

The question as to whether anyone was evaluating health in offshore animals was asked. The response was that sampling was limited due to high cost per animal and logistical complications. Biopsy dart samples of blubber are collected and analyzed for contaminant levels. Comments were made about the relationship between density and health scores, indicating that the average health of the population could be determined if the correlation between health status and population status could be determined. It was also suggested that one would have to determine if the populations were resource limited. A comment was made that there may be human activities that may affect the health of individuals and populations through habitat displacement, behavior, etc. Panel members concurred that health assessment is important, but suggested caution in using contaminant levels as a sole cause of changes in condition.

To address effects at the population level, longitudinal studies are preferred. This requires site-specific studies. A population that is less stressed should be identified as a baseline. Some concern was expressed that some species other than bottlenose dolphin might be more appropriate for examining the effects of contaminants because: 1) bottlenose dolphins occur commonly in areas where they are likely to have been exposed to anthropogenic contaminants; 2) the fact that bottlenose dolphins appear to live successfully in coastal areas, where anthropogenic contaminants are present, may indicate that they either are insensitive to, or have evolved mechanisms which allow them to tolerate, environmental contaminants; 3) if you were designing a study to try to document possible cause-effect relationships, you likely would choose a species less likely to have been exposed to anthropogenic contaminants over many generations. Other Panel members indicated that the fact that there have been no bottlenose dolphin population declines clearly connected to environmental contaminants does not necessarily mean the species is physiologically adapted to tolerating anthropogenic contaminants.

I.A.5.b. Life History

Until recently, the MMRP has participated in life history research through sponsored studies (*e.g.*, Barros 1992, Hohn *et al.* 1989, Read *et al.* 1993, Tolley *et al.* 1995, and Wells and Scott 1990). In 1996, a focus for life history studies began at the Beaufort Laboratory with the intent, among other things, to obtain reliable estimates of the age and reproductive composition of stranded and entangled marine mammals, estimate life history parameters, and evaluate the impacts of incidental mortality on coastal stocks of bottlenose dolphins.

Hohn discussed that the recently established lab in Beaufort is finally functional following set-up using FY96 funding. Progress on a couple of projects was made at the Smithsonian over the summer, particularly on estimating age for bottlenose dolphins from the coast of Texas and Florida for a contaminants study in collaboration with the NWC and working up samples to develop growth curves for onshore and offshore bottlenose dolphins from the mid-Atlantic. However, funding for the life history lab to work-up samples from fishery interactions and the stock study, as well for re-evaluating the die-off and changes in the population since then, was not rated sufficiently high to expect funding for FY97. Current supplies and staff will be used for prior commitments of relatively small sample sizes.

II.B. LARGE WHALES IN COASTAL WATERS

II.B.1. *Mortality Estimation*

The number of strandings of large whales, particularly humpbacks, in the Southeast Region has increased in recent years. In those mortalities, ship-strikes and entanglements in fishing gear have been found to have had significant role (Blaylock *et al.* 1997). To address the increasing number of strandings of large whales, the MMRP established a large whale stranding response team in 1994, and held the Large Whale Stranding Response Workshop in 1995 to standardize protocols and coordinate response to strandings of large whales through the establishment of the Large Whale Stranding Response Teams (Blaylock *et al.* 1997). The primary purpose of a Large Whale Stranding Response Team is to conduct thorough necropsies of all species of endangered whales which strand in the Southeast Region (response to right whale strandings is coordinated with the New England Aquarium, which receives funding from the NMFS to investigate northern right whale strandings in the U.S. Atlantic). The MMRP provides organizational, logistic and financial support to the Large Whale Response Teams.

Larry Hansen presented for Blair Mase data on large whale mortality. From 1987-1995 within the southeast region, North Carolina and Florida have had the highest number of large whale strandings. There are also a large number of whale strandings, particularly humpback whales, in Virginia (part of the northeast region). In NC, 44% of humpback strandings exhibited signs of human interaction, from both gear and boat strikes. A large number of stranded right whales in the southeast were less than five meters (*i.e.*, were young calves). In the mid-Atlantic, the majority of stranded humpback whales are about 10m in length, which is thought to be about 1 year of age.

What is the cost for the large whale response teams? Large whale stranding response is part of the stranding coordinator position. In addition, F/PR has allocated funds for large whales that is helping SEFSC cover costs associated with response by non-NMFS individuals with expertise in large whale mortality. The Panel recommended that SEFSC continue to conduct detailed necropsies on all stranded large whales.

The Panel asked whether SEFSC is involved with have any platform of opportunity observer programs (*e.*g., with the Coast Guard or Navy). Some reports are made but are not necessarily considered reliable. SEFSC has placed observers on Coast Guard helicopters in some areas. In the GA-FL right whale areas, anyone who might see these animals has been instructed on a proper reporting protocol.

It was questioned whether there is any idea of the number of humpback whales occurring in the area of VA-NC during those times of high stranding frequencies? The Virginia Marine Science Museum has begun surveys, but the numbers were unavailable during the Review.

II.B.2. *Bycatch Reduction/Recovery and Conservation*

The MMRP has not directly conducted research which focussed on large whales; however, funding has been and is being provided through the MMRP to monitor northern right whales in their winter critical habitat along the southeastern U.S. Atlantic coast (this is the only known calving ground for this stock). Ship-strikes account for much of the know human-induced mortality of northern right whales. The MMRP oversees a contracted right whale monitoring system (Right Whale Early Warning System), which relies on aerial surveys, to alert vessel traffic to the presence of right whales in the winter critical

habitat (Slay *et al.* 1996, 1997). This system is now in its third year of operation. Funding was also provided in the winter of 1995-1996 to satellite tag right whales in the winter critical habitat to monitor fine-scale movements (Slay 1996, Slay and Kraus 1997). Three tags were attached, and an additional two tags will be deployed in the winter of 1996-1997. Analysis of the 1995-1996 data is underway.

The Right Whale Early Warning System, in use since 1993, uses aerial surveys designed to help avoid ship strikes in winter critical habitat. The winter critical habitat runs from south of Jacksonville, FL to mid-Georgia. Aerial surveys have been carried out from December to March. The Northeast Fisheries Science Center (NEFSC) surveys the northern part of critical habitat, GA monitors the central area, and FL monitors the south. In response to incidents with the Navy last year, GA and FL have extended their surveys farther than the designated critical habitat. It was noted that the EWS operates only during daylight hours and, therefore, whales are not protected at night. Concerns were expressed that since we do not know the animals' day to day movements, we will not be able to truly define their critical habitat. Satellite tags have been deployed to address this issue. Last year three tags were deployed; two more are funded for this season.

It was recommended that the SEFSC become more involved in right whale research. The panel debated about how SEFSC should be involved, bearing in mind the need to not duplicate work carried out by NE Region. SEFSC is already part of the right whale implementation team. There were questions about the research SEFSC could do to complement current efforts, as well as who would carry out large whale research. For example, defining fine scale movements through satellite and VHF tagging is essential.

It was briefly mentioned that the photo-id data set has not been analyzed to the fullest in order to assess the stock's status. ASRG recognized the need to do this, and a NEFSC representative indicated that a proposal to do so was already underway. It was also asked whether research is being done on calf production? How many calves are there? Last winter 22 mother-calf pairs last year were sighted. The issue of whether a GIS-based system has been implemented in the SEFSC was raised. The Region responded that the States had been contracted to set up a GIS system. This system should supplement the aerial survey data.

Links with other agencies should be developed to reduce costs and staffing. Research to date has been mostly reactive, and the panel felt that SEFSC should take on a more proactive approach. Due to the very limited number of researchers working on right whales, current data management is weak. Hopefully with assistance from the large whale coordinator to be hired in F/PR, the SE and NE regions will be able to coordinate their efforts to improve joint ventures. At the recent Marine Mammal Commission meeting, three critical points were made: 1) recovery teams were set up for both right and humpback whales; 2) coordination between NEFSC and SEFSC is unclear; and 3) the lack of stable funding is a historic problem with right whales.

SEFSC was commended for its large whale response team, designed to determine cause of mortality for stranded large whales, and continued immediate response to all stranding reports was recommended.

What problems exist in the SEFSC for which external help would be useful? The SEFSC representatives felt that the administrative task of overseeing increased right whale research would overwhelm an already small and overworked staff. However, members of the SEFSC can offer valuable skills, such as contaminant analysis, photo-id skills, and aerial surveys that could be used to further Atlantic right whale research.

II.C. PELAGIC CETACEANS

II.C.1. *Stock Assessment - Abundance*

Keith Mullin gave an overview of stock assessment of pelagic cetaceans. Vessel surveys have been conducted in the Gulf of Mexico, Atlantic, and Caribbean Sea. An aerial survey program was conducted in the Gulf. The objectives of the surveys were to study abundance, diversity, stocks (biopsy sampling), spatial and temporal distributions, and habitats. Vessel surveys followed the line-transect methodology developed by the Southwest Fisheries Science Center. Analyses were done using program DISTANCE (Laake *et al.* 1994).

The first studies the MMRP conducted on pelagic cetaceans were MMS-sponsored, small-scale, aerial surveys in the northern-central Gulf of Mexico during 1988-89 (Mullin *et al.* 1991, 1994). The MMRP conducted the first pilot shipboard survey for cetaceans in all pelagic waters of the U.S. Gulf of Mexico (400,000 km^2) in 1990. Based on the results of the aerial and shipboard surveys, the MMRP proposed and conducted a series of seasonal aerial and spring shipboard surveys to estimate the distribution and abundance of pelagic Gulf cetaceans (Hansen *et al.* 1995, 1996). Current estimates are based on spring vessel surveys conducted from 1991-1994. These surveys were funded with a combination of MMPA/ESA funds and MMS funds (see below). A total of 22,041 transect km was surveyed and resulted in 850 sightings of 21 species. Pantropical spotted dolphins were by far the most abundant species with an estimate of 31,320 (CV = 0.20) dolphins. The next most common species was the spinner dolphin with an estimate of 6,316 (CV = 0.42) dolphins. Other species were more commonly sighted (*e.g.*, *Kogia* spp., Risso's dolphin, bottlenose dolphin) but had smaller group sizes. The sperm whale was the only common large whale. Cetaceans were found in all waters surveyed however some species had distributions that were generally restricted to the eastern or western Gulf, or were restricted areas close to or away from the continental shelf break (waters about 200 m deep).

Much of this work was a result of cooperative research with the MMS, Gulf of Mexico Region (*i.e.*, GulfCet Program). The GulfCet Program focused in the continental slope in the northwestern Gulf (see below).

In 1992, the MMRP and Texas A&M University began the MMS GulfCet Program to study the seasonal diversity, abundance and distribution of cetaceans in the northern Gulf of Mexico in areas where minerals development could occur in the near future. GulfCet I is completed (Davis and Fargion 1996) and focused on the continental slope (waters 100-2,000 m deep) in the north-central and northwestern Gulf (154,621 km^2). The research consisted of ship (see above) and aerial line-transect surveys over a two year period. Nearly 50,000 transect km were surveyed during eight seasonal aerial surveys conducted from Summer 1992 through Spring 1994 (Hansen *et al.* 1996). Sixteen species were identified in 351 aerial sightings. At least 10 species were sighted in every season of the year. Four other species were sighted in at least three seasons. Cetaceans were widely distributed in the study area during each season. The fall was generally a time of decreased abundance. Precision of the abundance estimates measured as a CV for the common species ranged from 0.20-0.31. The seasonal abundance of common species was variable (Risso's dolphin, *Kogia* spp., pantropical spotted dolphin) but CVs were generally high. Another important objective of GulfCet I was to attempt to define cetacean habitats. Several species appeared to be strongly associated with physiography whereas relationships to oceanographic variables were less clear. GulfCet II was initiated in Spring 1996 and, generally, will consist of similar research in the northeastern Gulf through Winter 1998.

A shipboard survey for pelagic cetaceans occurring off the southeastern U.S. Atlantic coast was conducted during February and March, 1992. The survey sampled approximately 2,800 km of transect and resulted in 61 sightings of cetacean groups. The weather conditions were poor during most of the survey, and as a result, insufficient numbers of sightings were collected for estimating the abundance of the majority of species observed (Hansen *et al.* 1994). The MMRP plans to conduct a shipboard survey in this area, in conjunction with a survey of the northeastern U.S. Atlantic coast to be conducted by the NEFSC, during 1998.

The waters of the U.S. Caribbean were sampled for cetaceans with a shipboard survey during January-March of 1995. Although about 4,300 transect kilometers were sampled and 70 cetacean groups sighted, the number of samples collected were considered insufficient for producing abundance estimates. The MMRP proposed using aerial surveys to sample these waters in 1997 with funding support from MMPA assessment funds, but this project was determined to be of low priority at the national level and was not funded.

The following future research priorities were presented for comments from the review panel:

1. Good weather surveys of the U.S. Atlantic from the beach to the EEZ. The objectives will be to collect line-transect data, biopsy samples (all species over wide geographic ranges) and associated environmental data. These surveys will be coordinated with the NEFSC. The first survey will be conducted in 1998. If sighting rates are similar to those from the Gulf, these surveys will need to be repeated for 4-5 years to obtain abundance estimates for common species with *CV*s near 0.20. The importance of this survey was emphasized by the Review Panel.

2. Ship surveys of the continental shelf in the Gulf of Mexico to collect line-transect data and biopsy samples of bottlenose dolphins (see above) and Atlantic spotted dolphins. The current estimate of Atlantic spotted dolphin stock size is based on results of oceanic ship surveys and without doubt a severe underestimate. A ship survey of Florida continental shelf waters indicated that in waters from 20 to 100 fm deep that spotted dolphins were extremely common and more common than bottlenose dolphins.

3. While abundance estimates for oceanic Gulf waters exist, with current annual effort level, it takes 4-5 years to obtain abundance estimates for common species with *CV*s of 0.20. Therefore, these surveys should be continued on an annual basis. (Surveys can be "piggy-backed" on ongoing bluefin tuna ichthyoplankton surveys and can be conducted for about $25,000 annually.) The Review Panel was concerned that given the limited marine mammal staff at the SEFSC, that the focus of the vessel surveys should now be placed in the Atlantic and conducting both surveys may not be possible.

4. Place emphasis on collecting necessary data and conducting follow-up analyses in order to define cetacean species habitat in biological and oceanographic terms. It was acknowledged that this type of work was important and could lead to better survey design and more precise abundance estimates in the future.

5. Initiate surveys of the southern (Mexican) Gulf of Mexico. Currently, changes in the abundances of northern Gulf species would be very difficult to interpret since they could simply represent a shift in distribution. While there was general support for this work, it was suggested that this is true of all abundance estimates. However, the small size of the Gulf and its extremely dynamic oceanography may make it more conducive to the movement of cetaceans. There was also some discussion about whether

these survey would serve the mandate of the MMS or the NMFS and where funding for these survey would originate.

6. Currently, there are no data on which to base stock assessments for marine mammals in the U.S. Caribbean Sea. It was commented that there were probably no serious non-natural mortality issues in this area and that stock assessment work was therefore not a high priority.

7. Initiate, continue and/or support sperm whale genetic and habitat use research (biopsy and photo-identification). Sperm whales are an endangered species, the only large whale that is common in the Gulf (*i.e.*, they are important ecologically), and apparently have a complex social structure (*i.e.*, specific areas could be very important to specific individuals or groups of related individuals). No comments were made.

8. Initiate, continue and/or support Bryde's whale genetic and habitat use research (biopsy and photo-identification). Bryde's whale apparently have a complex genetic make-up world-wide (there may be more than one species). The northern Gulf "population" is apparently very small, may be isolated and restricted geographically. No comments were made.

9. Since most of the surveys are usually restricted to one season of the year but impacts can occur throughout the year, the importance of seasonality was brought up. No specific comment were made.

A number of additional comments were made. As with the aerial surveys, correction factors to estimate absolute abundance should be explored for vessel surveys. If possible, these may be in the form of SEFSC g_0/dive experiments or if deemed appropriate application of correction factor from other areas to SEFSC estimates. When asked, it was noted that there are a number of strategic stocks in the Gulf and Atlantic besides coastal bottlenose dolphins. (In the Atlantic they include six endangered species, two stocks of bottlenose dolphin and 14 other species. In the Gulf, one endangered species and three other species.) The Review Panel noted the identification of the pygmy sperm whale (*Kogia breviceps*) and the dwarf sperm whale (*Kogia simus*) as strategic stocks should be reconsidered. Abundance estimates for *Kogia* spp. are probably extremely conservative (both species are extremely cryptic and estimates are uncorrected for dive times and therefore conservative) and strategic stock status in each case is based on observed human interaction (*i.e.*, ingestion of plastic bags) and possible boat strikes. It was questioned whether it is appropriate to classify marine-debris related mortality as non-natural mortality (and thus the strategic stock classification for *Kogia*). Also, NEFSC and SEFSC should identify *Kogia* sp. consistently, either by species or generically as identify *Kogia* sp.

An inquiry about acoustic surveys was made. Texas A&M University conducted acoustic surveys on non-SEFSC vessel surveys during GulfCet I. There were correlations between visual and acoustic sighting data for sperm whales, producing and abundance estimate that was very close to the visual estimate (Norris *et al.* 1996). It was noted that the MMS can not answer their basic questions without addressing habitat issues.

II.C.2. *Mortality Estimation - Long-line Observer Program*

The SEFSC places observers aboard long-line vessels operating in the Gulf of Mexico, Caribbean, and Atlantic, with the primary goal of estimating catch of swordfish and tuna. Additional funding was obtained for several years from the MMPA observer funds to increase the percentage of trips observed in

order to estimate the level of marine mammal take in the fishery. Observed takes were infrequent, and nearly all of the cetaceans taken were released alive (Blaylock *et al.* 1995). At least three and possibly five cetacean species were observed taken in this fishery: pilot whales (either or both species), Risso's dolphin, and spotted dolphins (either or both species). The estimated take of the U.S. Atlantic stock of short-finned pilot whales in this fishery exceeds the stock's potential biological removal level (PBR) (Blaylock *et al.* 1995).

The long-line fishery has been changed from a category 2 to category 1 fishery. It has been monitored from 1992-1995. In 1996 the NEFSC took responsibility for the area north of 35°N. The main objective of this observer program is stock assessment of tunas and billfish. The goal has been to cover 5% of fishing effort (sets), however, actual coverage has varied: in 1992, 2.3% of the sets were observed; in 1993, (5.2%; in 1994, 4.6%; and in 1995, 5.3%. The program was initially funded by Congressional add-on for swordfish, then some protected species money added. In the last year and a half, only swordfish funds have been provided for observer coverage. Only SE data was presented here, although NE has data with evidence for large takes of marine mammals.

In the program out of the southeast, from 1992 to 1995 thirteen cetaceans were observed entangled: 5 Risso's dolphins, 4 pilot whales, 1 pantropical spotted dolphin, 1 Atlantic spotted dolphin, 1 bottlenose dolphin and 1 unknown cetacean. All of these were live entanglements with the exception of one Risso's dolphin. In 1996, four Risso's dolphins were taken, one of which was dead.

Why does it take so long to get the marine mammals data? The marine mammal portion of the data is actually ready quarterly, but the calculation of fishing effort and mortality estimations can take up to a year. The data are actually in four different databases, with no single person in charge. Also, generating the estimates of marine mammal take is not a high priority due to the focus of the program -- it is a *resource* program, not a marine mammal program.

Are any voucher materials kept from these takes? Yes, samples were collected from one of the two animals that died. NEFSC gets more dead animals, thus their observers are trained to bring back more specimens. The Panel strongly recommended that as many samples as possible be collected in the future, regardless of the number of animals that die.

Is there a set data sheet to prompt the description of injuries if and when they occur? It is important to sort out the degree of injury, as it projects mortality. The suggestion to develop a checklist to identify injuries was made. Plans already exist to use incorporate an existing checklist into the observer protocol. How close do the observers get to entangled animals? Captains do not like to get close to animals that are still alive. Thus the checklist should have an option that indicates if the observer was close enough to determine the seriousness of the injury. How are entangled animals released? Often, the line breaks or is cut. What is the fishery worth? Landed value of the fish is $4.50-$6.00 per pound, resulting in a multi-million dollar fishery but not hundreds of millions of dollars.

III. PANEL RECOMMENDATIONS

Following the presentations and discussions, the Panel met in closed session to deliberate and develop recommendations for future priorities for the MMRP at the SEFSC. The outcome was a comprehensive list of research needed on bottlenose dolphins, right whales, pelagic cetaceans, the long-line observer program, and large whales, as well as general recommendations, considered important for the Center to

fulfill its mission related to marine mammals (Attachment II). In a memo from the Panel to Dr. Brad Brown, SEFSC Director, the panel highlighted a subset of those recommendations, identifying 9 Urgent Actions, 3 Critical Actions, and 3 Extremely Important Actions that the Center should adopt immediately because they are critical to the successful management of marine mammals in the SE region (Attachment I).

IV. ACKNOWLEDGMENTS

Conducting a review as encompassing as this one, especially in such as limited time requires the input and cooperation of many individuals. Background documents or text for the review were drafted by the authors, Keith Mullin, Blair Mase, Caterina D'Agrosa, and Katie Touhey. Presentations were made by the authors, Blair Mase, Keith Mullin, James Tobias, and Randall Wells. Caterina D'Agrosa and Katie Touhey served as rapporteurs and typed up their notes for use in this report. A special thanks to Mary Nunez for making all the travel arrangements for the Panel. Logistics at the meeting were taken care of by Blair Mase, Mary Nunez, and James Tobias. Sylvia Galloway deserves our admiration and gratitude for facilitating a sometimes contentious meeting. The authors and the SEFSC especially thank members of the Panel who took time from their other commitments to assist the SEFSC in developing a targeted, prioritized research program for the coming years.

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APPENDICES

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II. Agenda and Guide to the Review Process

December 11, 1996

I. Background

0900: Welcome and Introductions

0930: Review Objectives and Agenda - Hansen

1015: Factors Influencing Program Directions - Hansen
1. 1989 Program Review Recommendations
2. Other Research Needs (e.g., Minerals Management Service, Anomalous Mortality Events)
3. MMPA Mandated Research Activities, ASRG Recommendations
4. Human Resources

1230: *Lunch*

II. Review and Discussion of Research Conducted from 1989-present and Future Plans

A. Coastal Bottlenose Dolphin Stocks

1330: Stock Assessment
1. Abundance
    a. Regional Aerial Surveys - Mullin
    b. Low-level/Site-specific monitoring - Wells
2. Structure - Hohn
    a. Photo-id
    b. Genetics
    c. Other

1700: *Adjourn* (Social: 1700 - 1900, at RSMAS)

December 12, 1996

0830: Mortality Estimation
1. Strandings - Mase
2. Observer Programs
    a. Coastal Net Fisheries - Carlson, Hansen
    b. NC Coastal Net Fisheries - Hohn

1130: Bycatch Reduction/Recovery and Conservation - Hohn

1230: *Lunch*

1330: Long-Term Research
1. Health Assessment - Hansen
2. Life History - Hohn

1730: *Adjourn*

December 13, 1996

B. Pelagic Cetaceans

0800: Stock Assessment
1. Shipboard Surveys - Mullin
2. Aerial Surveys - Mullin
3. GULFCET I and II - Mullin

1000: Mortality Estimation
1. Long-line Observer Program - Lee

C. Large Whales in Coastal Waters

1130: Mortality Estimation
1. Strandings - Mase

1230: *Lunch*

1330: Bycatch Reduction/Recovery and Conservation
1. Right Whale Early Warning System - Hansen

III. Summary

1400: Closed session for Panel Members

1700: Final Comments, Agreement on Significant/Major Recommendations, Review Report Preparation, etc.

1730: *Adjourn*

Guide to Review Process

The following questions should serve as a guide to the presenters and reviewers of this Program. The review panel should consider issues deemed relevant by the panel, whether covered by this list or not.

Management/Programmatic Considerations:

1. Are the resources concentrated on critical aspects of NMFS marine mammal issues?
2. Are the Program goals clearly stated and attainable?
3. How are research priorities established?
4. How do research projects originate?
5. Are there important marine mammal issues not being addressed by the Program?
6. Does the Program have sufficient flexibility to meet changing directions?
7. How is the Program evaluated? Is there sufficient feedback from those using the Program?
8. What are the strengths and weaknesses of the facilities, equipment, and personnel associated with the Program?
9. Are there any critical problem areas that impact the ability of the Program to conduct marine mammal research activities?
10. Does the Program have unique capabilities that should be enhanced or better utilized?
11. Is the current staffing arrangement appropriate?
12. Are the current facilities adequate for the activities being conducted?
13. Are there changes in facilities/personnel/equipment that might be considered to improve the Program?
14. How does the Program integrate with other NMFS activities? with academic, private, and other governmental units?
15. What is the nature of the interactions between the Program and other researchers and agencies?
16. How does the Program respond to its constituency?

Technical/Scientific Considerations:

17. Does the Program address the most significant technical issues associated with marine mammal research?
18. Has the Program developed methods appropriate to the goals?
19. What types of quality assurance/quality control activities exist within the Program? Are they adequate?
20. Does the Program have plans to develop methods needed to address marine mammal issues? Does the Program have knowledge of these needs?
21. Should the Program continue to develop methods as well as apply them to marine mammal issues?
22. What are the most significant recent accomplishments of the Program?
23. What are the major limitations precluding the Program from addressing important marine mammal issues?
24. What might be the future direction for the Program? What should the major emphasis be?

III. Recommendations from the Review Panel

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TO: F/SEC - Brad Brown
F/PR - Pat Montanio
FROM: F/AKC3- Douglas P. DeMaster
Spokesperson for the Review Panel
DATE: February 26, 1997
RE: Recommendations from Marine Mammal Review Panel

The review panel (see attachment 1) commends the staff of the marine mammal program at the Southeast Fisheries Science Center for their willingness and ability to address a wide range of issues and to present their findings in a concise, useful manner. The logistics for the meeting and support during the meeting were excellent and the convener, Larry Hansen, and the facilitator, Dr. Sylvia Galloway, should be congratulated. The panel was disappointed that the Director and Deputy Director of the Center were unable to participate more fully in the review; however, the panel understands that other pressing obligations occupied their time.

The panel noted that the marine mammal program at the SEC has three primary areas of notable performance and expertise: 1) life history analysis, 2) response to stranding events, and 3) survey capability. In addition, staff and long-term contractors have developed intensive programs to assess habitat use, behavior, general health and other aspects of the biology of bottlenose dolphins occupying specific coastal areas, especially Sarasota Bay. There was strong support from panel members to continue such programs in the future, although some specific methodological changes may be useful.

The panel further noted that the diversity and areal extent of marine mammal issues in the SEC were not substantially less than in the other three centers (excluding the NWC, where it's marine mammal information needs are provided by the National Marine Mammal Laboratory, AKC), but that support for the marine mammal program at the SEC was substantially less than at the other centers. That is, five or six FTPs with base support of approximately $400K (including salaries) are far less than the support provided to the marine mammal programs at the AKC, NEC, and SWC. This lack of support has manifested itself in several ways: 1) a coherent vision for the marine mammal program at the SEC is lacking, 2) the number of peer-reviewed scientific papers related to the SE region authored by SEC staff is relatively small, 3) the time available for the marine mammal staff to coordinate and cooperate with other NMFS staff and non-agency experts is insufficient, and 4) the diversity of expertise within the SEC's marine mammal program is inadequate to meet the needs of the Region and agency as a whole (e.g., only two

Ph.D. level scientists are assigned full-time to conduct research on marine mammals). In particular, the lack of a state of the art quantitative population biologist and the lack of a dedicated right (or large) whale biologist was obvious.

The panel was made aware of the existence of two available FTP positions (i.e., program coordinator and vice-Blaylock positions) at the SEC for marine mammalogists. However, the panel recommends that a minimum of three additional staff be hired: a marine mammal coordinator, a large whale biologist, and a quantitative population biologist. Given the difficulties in securing new positions and adequate funding, the panel further recommends that, as openings become available at the SEC, additional positions be reprogrammed into the marine mammal program until a minimum of eight FTPs are filled. Finally, although the review panel understands that there are administrative reasons why the coordinator should be located at the Miami Lab, the panel notes that there are compelling reasons for that individual to be located at a SEC laboratory where more marine mammal activities occur to ensure that a critical mass of expertise exists within at least one laboratory. In light of the extent to which electronic communication has improved, some reasons for having the Program Coordinator at the same laboratory as the Center Director seem unimportant. Therefore the panel strongly suggests consideration be given to placing the marine mammal program director at a laboratory other than the Miami Laboratory.

The panel assigned specific recommendations to one of six categories: bottlenose dolphin task, right whale task, pelagic cetacean task, long-line observer program, large whale task, and general recommendations. All of the recommendations included in these six categories were considered important for fulfilling the SEC's mission related to marine mammals (see attachment 2): i.e., recovering depleted populations, maintaining healthy populations, and minimizing conflicts between marine mammals and fisheries. However, a subset of the above-mentioned recommendations were identified as critical to the successful management of marine mammals in the SE Region. The panel recommends that the following actions be adopted immediately. To be of as much use to you as possible, the panel further separated this subset of 15 actions into Urgent, Critical, and Extremely Important (note: within a particular category, actions were not prioritized, and specific references to activities identified in attachment 2 are enclosed in parentheses):

Urgent Actions

1. Expand senior-level scientific staff at SEC. *(GR 2,3 and LWR 4)*
2. Hire marine mammal program coordinator, whose first charge would be to develop a vision for the marine mammal program at the SEC and a three to five year strategic plan. *(GR 1,3)*
3. Complete conservation plan for bottlenose dolphins incorporating input from staff of the SEC, SER, and F/PR. *(BDR A.I)*
4. Expand stock structure work on bottlenose dolphins along the Atlantic ocean and in the Gulf of Mexico. *(BDR B.II)*

5. Formulate hypotheses, based upon the best available data, of bottlenose dolphin stock structure and design and, as possible, conduct surveys to estimate the minimum size of each presumptive stock. *(BDR B.II)*
6. Obtain more reliable estimates of marine mammal mortality in all net fisheries in the SE, especially for bottlenose dolphin, harbor porpoise, and humpback whales in mid-Atlantic fisheries. *(BDR C.I, II)*
7. Expand efforts to determine the abundance of right whales in the North Atlantic using the photo-ID database (i.e., mark-recapture type estimates). *(RWR 4)*
8. Expand efforts to determine the winter distribution and fine-scale (i.e., daily and weekly) movements of right whales in the SE, using satellite and VHF radio tags, as appropriate. *(RWR 1,2)*
9. Conduct joint NEC/SEC cetacean vessel survey in the Atlantic in 1998. *(PCR 1, 2, 3, 6)*

Critical Actions

10. Continue support of the long-term studies of bottlenose dolphin in Sarasota Bay and adjacent areas. *(BDR C.II, G.II)*
11. Continue support for the SEC's marine mammal life history laboratory at Beaufort, NC. *(BDR B.Ie, G.VI)*
12. Require that observers on commercial fishing vessels and alternative platforms collect skin and tissue samples from marine mammals that are caught. This would allow species verification and analysis of genetic diversity and contaminant levels. *(BDR B.Ie, RWR 7, LLOPR 3, PCR 2)*

Extremely Important Actions

13. Continue to support and fund the existing stranding network. If possible, convert the network coordinator's position to an FTP position within the SEC. *(BDR C.Ib, FI,II, G.I)*
14. Expand efforts to determine and subsequently obtain information needs for mitigating marine mammal-fishery interactions. *(BDR C.IIc, C.III, G.II)*
15. Create more opportunities and incentives for the marine mammal staff to publish research results in peer- reviewed journals. *(GR 7)*

Finally, the panel made two additional recommendations: 1) delay the formation of a Take Reduction Team for mid-Atlantic fisheries, as the data on fishery-related mortalities, stock identification of marine mammals, stock-specific abundance, and trends in abundance for many of the marine mammal species that interact with these fisheries are currently unavailable, and 2) working with F/PR, the SEC should develop other funding sources for its environmental contaminant program.

If you have any questions regarding any comments or recommendations of the panel, please feel free to contact me or any of the panel members. As noted, the panel was pleased with the level of preparation and quality of the presentations made by the staff of the SEC. Hopefully, the

recommendations of the panel will be of use to you in strengthening the marine mammal program at the SEC so that it can more fully meet the information needs of the SER and F/PR in managing marine mammal populations in this area.

Attachment 1. List of Review Panel Members.

Name	Affiliation
Solange Brault	**University of Mass., Boston**
Robert Brownell	**NMFS- SWC**
Phil Clapham	**Smithsonian Institution**
Douglas DeMaster	**NMFS- AKC**
Tom Eagle	**NMFS- F/PR**
Mike Harris	**Georgia Dept. Natural Res.**
Robert Hofman	**Marine Mammal Commission**
Bill Lang	**Minerals Management Service**
Debra Palka	**NMFS- NEC**
John Reynolds	**Eckerd College**
Teri Rowles	**NMFS - F/PR**
Michael Scott	**Inter-American Tropical Tuna Comm.**
David St. Aubin	**Mystic Marinelife Aq.**
Steve Swartz	**NMFS - F/ST**
Paul Wade	**NMFS- F/PR**
Kathy Wang	**NMFS- SER**

Attachment 2.

BOTTLENOSE DOLPHIN: RECOMMENDATIONS (BDR)

The Panel recommended the following:

A. Inadequate basis for long-term planning and priority-determination/setting.

I. Complete development of regional conservation plan(s).

Lead organization: NMFS SERO and F/PR.

Cooperating organizations: SEFSC and NEFSC, relevant state agencies, MMS, EPA, etc.

II. Use conservation plan to identify other federal, state, and private organizations with relevant responsibilities and interests. Solicit support for research and management related activities, as appropriate.

B. Insufficient information to make defensible and sufficiently reliable PBR estimates (due to uncertainty concerning stock identity and minimum abundance).

I. Continue and expand efforts to identify functionally discrete stocks in both the Atlantic and Gulf.

a. Review available information on distribution, movements, morphology, genetics, isotope ratios, etc. and formulate hypotheses concerning likely/possible discrete stocks (offshore, coastal, estuarine).

b. Design and conduct combined vessel-based surveys and biopsy-sampling programs to determine if there are detectable genetic differences between animals from hypothesized offshore, coastal, and estuarine stocks (resolve uncertainties concerning the discreteness and distributional ranges of offshore, coastal, and estuarine stocks in both the Atlantic and Gulf).

1. Atlantic - should be done as part of the proposed 1998 joint NE/SE cetacean survey using the Oregon II and small boats as necessary to obtain distribution and abundance data and biopsy samples from representative inshore areas.

2. Gulf- plans should be made for a vessel-based survey and biopsy program of the nshore area of the Gulf of Mexico (specifically the area between the coast and the inshore border of the Oregon II pelagic survey area).

c. Design and conduct a satellite and radio- tracking program to determine movement patterns (home ranges) of different age/sex classes of animals in representative areas hypothesized to have discrete offshore, coastal, estuarine stocks.

d. Continue, expand and improve coordination of long-term site-specific studies (cooperating with independent investigators to the maximum extent feasible).

e. Continue collection and assessment of whole specimens and tissue and diet samples to document geographic differences in isotope and contaminant ratios, morphology, parasite lesions and diet (using specimens/samples obtained from stranding program, fishery bycatch, biopsy programs, and live captures).

f. Bottlenose dolphin stock structure in the Gulf of Mexico should be reconsidered (e.g., combine the two offshore stocks into a single offshore stock).

II. Identify areas/stocks from which more reliable minimum abundance estimates are needed and design and conduct studies to obtain the needed estimates.

a. Complete analyses and reporting of unpublished survey data.

1. If a preliminary stock boundary can be drawn for coastal bottlenose dolphins (such as within 10 miles of the coast), reanalyze Atlantic aerial survey data to produce an estimate for that area.

2. Produce distribution maps of sightings along with on-effort track lines.

b. Review available data, including data from volunteer boat surveys, to identify areas for which more reliable estimates are needed, especially concerning populations in bays and estuaries in the Atlantic.

c. Assess the relative costs and benefits of aerial, ship, and combined aerial-ship surveys.

d. Design and conduct surveys to estimate abundance of specific stocks, based on the working hypothesis for stock structure.

1. Use population with known abundance to develop survey protocol for bays and estuaries.

2. Estimate g(0) and f(0) for a variety of areas and test the extent to which these statistics can be pooled among areas and over time.

C. Insufficient information to reliably estimate and monitor sources and levels of human-related mortality, injury and harassment.

I. Identify areas and fisheries for which more reliable estimates of fishery-related mortality and injury are needed and how the needed estimates can be obtained most cost-effectively.

a. Review available data from the SE Center to determine if fisheries are being correctly classified by the SE Regional Office. Further, determine the extent to which more reliable estimates of fishery-related mortality and injury are needed.

b. Review, continue, and, as necessary and possible, improve the regional stranding/necropsy program to get better information on locations, sources and levels of fishery- and other human-related mortality.

c. Conduct pilot programs in North Carolina, Virginia, and Maryland to determine if regular beach surveys and observations from small boats can provide more reliable information on locations, levels and sources of fishery-related mortality (this pilot program should include evaluation of direct observation of the potential for obtaining data on marine mammal bycatch in near shore fisheries by direct observation from shore).

d. Continue, expand, or initiate observer programs to estimate stock specific mortalities in Category I and II fisheries.

II. Identify locations, sources, levels and significance of non-fishery related mortality, injury and harassment.

a. Review available data to identify sources, locations, levels and possible significance of non-fishery related mortality, injury and harassment (e.g., dolphin feeding programs, commercial shipping, recreational boating).

b. Continue, review, and, as feasible, improve the regional marine mammal stranding/ necropsy program to help identify sources, locations, levels, and biological significance of non-fishery related mortality.

c. Continue the Sarasota long-term field study and, as feasible, initiate additional long-term, site-specific monitoring programs to document sources, levels, and significance of non-fishery related mortality, injury and harassment.

d. As possible, mitigate mortalities, injuries and harassment incidental to human activity.

III. Continue long-term programs to monitor and detect changes in fishery- and other human-related mortality and injury.

D. Uncertainty concerning (1) the validity of the determination that the 1987-1988 anomalous mortality event caused depletion of the Atlantic coastal migratory stock; and (2) criteria that can be used to determine when the stock has recovered and can be reclassified.

I. Complete tasks B. I. a and b (stock identification).

II. Reanalyze data and assumptions used to make the depletion determination, taking into account any new determinations concerning likely stock discreteness.

III. Inventory existing tissues collected from the animals that died during the 1987-88 mortality event and, if necessary, access and analyze the tissues to determine the stock or stocks from which the animals came.

IV. Taking into account the results of Tasks I, II, and III, determine and take such follow-up action as necessary.

E. Uncertainty and concern regarding the possible long-term effects of environmental contaminants.

I. Better identify and determine the presence, levels, sources, and possible harmful effects of environmental contaminants to populations of bottlenose dolphin.

a. Complete and report the results of contaminant analyses being done by the NWFSC and SEFSC.

b. Review available information to determine what has been or is being done by other agencies and how the SEC monitoring and assessment program might be integrated into or coordinated with other programs.

c. Using available information and outside expertise, evaluate the feasibility and potential value of determining the long-term effects of environmental contaminants at the population level.

II. Identify and evaluate possible alternative means for detecting possible harmful effects (e.g., individual and population health and condition indices; biomarkers; endocrine inhibitors/indicators; cellular models).

III. Taking into account the results of Tasks I and II, continue, expand, or initiate appropriate long-term monitoring and assessment programs.

F. Uncertainty concerning the classification and detection of, and response to, anomalous mortality events.

I. Review the response time and effectiveness of response to anomalous mortality events and recommend changes at the regional and national levels, as needed.

II. Review and revise the regional stranding network as necessary to improve detection and prompt response to anomalous mortality events.

III. Provide information to a working group (yet to be established) for an epidemiological study of morbillivirus to determine if morbillivirus mortalities continue to meet the criteria for anomalous mortality events.

IV. Investigate the possibilities and, if feasible, develop a permanent, publicly financed contingency fund.

G. The need for better, more complete, more useful baseline data.

I. Continue and, as possible, improve the regional stranding network.

a. Establish a web-site to enhance awareness of the SEC stranding network.

b. Elevate the regional coordinator to a full-time permanent staff position.

c. Include state coordinators and private cooperators as addressee for e-mail reports.

d. Encourage colleagues in Mexico to develop a comparable program.

e. Continue, as needed, specimen collection, archiving and analysis.

II. Continue the long-term longitudinal studies in Sarasota Bay and adjacent areas.

III. If stock structure analyses identify populations of different types, initiate site-specific studies in one or more representative populations of each type to investigate biological and behavioral characteristics of relevance to management. Decisions about the number and location of long term sites should be carefully and appropriately made.

IV. Assess the potential of volunteer survey and photo-ID programs and, if determined useful, develop and maintain a long-term data base on seasonal presence, abundance, etc., in embayments and estuaries.

V. Identify and use as appropriate existing or planned regional geographic information system and coordinate input of stranding and other geographically referenced data.

VI. Given the importance of life history data for answering biological questions and addressing critical management issues, the Beaufort Life History Laboratory should be strongly supported.

RIGHT WHALE: RECOMMENDATIONS (RWR)

The Panel recommended the following:

1. Given the current gaps in knowledge regarding patterns of occupancy and movement by right whales within the SER, a proposal should be developed for FY98 to investigate these characteristics through satellite or VHF radio tracking.

2. Ongoing efforts to estimate abundance and investigate population dynamics using existing photo-identification data should be expedited; in light of the apparent absence of significant segments of the population in the SER during winter, the abundance estimation would need to incorporate data from other areas of the right whale's range.

3. The SEC should continue to respond rapidly to all reports of right whale strandings and at-sea mortalities. In addition, collection and distribution of samples and data from carcasses should be conducted in a manner that maximizes the information gained from each mortality event.

4. The Panel noted that right whale sightings and mortalities had occurred outside the currently defined Critical Habitat in the SER, and recommended that appropriate methods be used to define the full extent of the species' winter habitat, including areas not currently covered (e.g., mid-Atlantic states).

5. Alternative methods to detect right whales in areas of high shipping traffic as a means of further reducing ship-strike mortalities should be investigated.

6. The currently advertized Large Whale Coordinator (LWC) position should: (1) be filled as soon as possible by an individual with extensive knowledge of right whales and other large whales; (2) incorporate a strong scientific component; and (3) that the LWC work closely with all relevant parties to coordinate organizations and activities within and among regions.

7. The SEC should have representation on both NE and SE Right Whale Implementation teams and at the Scientific Advisory Group meetings.

PELAGIC CETACEAN: RECOMMENDATIONS (PCR)

The Panel recommended the following:

1. The planning and design of the joint Southeast/Northeast Atlantic survey to determine stock-specific abundance, which is scheduled for FY98, should take advantage of expertise in abundance survey design within NMFS.

2. Tissue biopsy sampling should be considered a high priority on all offshore surveys whenever possible- especially for bottlenose dolphin, common dolphins, and pilot whales.

3. Appropriate correction factors for abundance estimates should be developed.

4. An optimal survey vessel for performing nearshore cetacean surveys (as recommended elsewhere), including the ability to work in shallower waters than the Oregon II, should be identified and utilized, as appropriate. Consideration should be given to using existing SEC laboratory boats (such as the shrimp trawler at the Pascagoula Laboratory). Vessels under consideration should be tested prior to the 1998 Atlantic survey.

5. The agency should be consistent in its species-identification protocol for *Kogia* in the Atlantic and Pacific.

6. The role of marine debris in causing mortality in *Kogia* or other species should be re-evaluated. Special efforts should be made to assess cause of death of stranded *Kogia*. If *Kogia* continue to be strategic, increased efforts should be made to obtain specimen from incidentally killed or stranded *Kogia* to allow for the estimation of various life history parameters.

LONG-LINE OBSERVER PROGRAM : RECOMMENDATIONS (LLOPR)

The Panel recommended the following:

1. Proposals for marine mammal mortality estimation in the long-line fishery in FY98 should be coordinated between the NEC and SEC.

2. A checklist for observed injuries (including photos) should be added to the forms used by observers to collect data from the long-line fishery. This checklist should be consistent with similar forms used in the observer program of the NEC.

3. A sampling protocol should be developed and tissue samples from entangled animals, especially dead ones, should be collected.

4. Responsibility for data analysis and estimates of marine mammal mortality in the long-line fishery should be established.

5 NMFS should determine whether to observe the portion of the swordfish driftnet fishery, which uses mesh size less than 18" and which is not covered under the current observer program and associated reporting system.

LARGE WHALES: RECOMMENDATIONS (LWR)

The Panel recommended the following:

1. Necropsies should be conducted on all large whales.

2. The large whale stranding workshop report should be completed by early 1997.

3. The age at death and cause(s) of death should be determined, as possible, for all humpback and right whales mortalities.

4. A full time, permanent biologist should be hired to: 1) help represent NMFS in the coordination of right whale research and management activities in the SE and NE Regions; 2) direct research on large whales, in particular right whales on their wintering grounds, in the SE Region, and 3) conduct research on large whales in the SE Region .

GENERAL RECOMMENDATIONS (GR)

The Panel recommended the following:

1. A 3-5 year strategic plan should be developed for the purpose of meeting the information needs necessary to address marine mammal issues in the SE Region. This plan should include research

priorities and lists of proposed actions that would take place under several alternative funding levels.

2. A full-time, permanent data analyst (i.e., quantitative population biologist) should be hired.

3. A full time, permanent Marine Mammal Program Coordinator should be hired.

4. Staff should be positioned (i.e., located) such that at least one of the laboratories has a critical mass of marine mammal biologists. For example, regarding the Program Coordinator, the review panel understands that there are administrative reasons why the coordinator should be located at the Miami Lab, the panel notes that there appear to be compelling reasons for that individual to be located at a SEC lab where more marine mammal activities occur and where critical mass of colleagues exists. In light of the extent to which electronic communication has improved, some reasons for having the Program Coordinator at the same laboratory as the Center Director seem unimportant. Therefore the Review Panel strongly suggests consideration be given to placing the program director elsewhere, (e.g., the Charleston Laboratory).

5. Cooperation among programs within the SE Center should be expanded and encouraged.

6. A budget documentation (accountability) system should be developed and maintained.

7. Timely publication of research results in peer-reviewed journals should be encouraged.

8. As possible, F/PR's recommendation to delay the creation of a Take Reduction Team for the mid-Atlantic fisheries should be supported.

IV: List of Publications and Reports completed after the 1989 Program Review from research conducted by SEFSC staff or supported in full or part by the SEFSC.

Peer Reviewed

Asper, E.D., L.H. Cornell, D.A. Duffield, D.K. Odell, B.E. Joseph, B.I. Stark and C.A. Perry. 1990. Hematology and serum chemistry values in bottlenose dolphins. Pages 479-485. *In*: S. Leatherwood and R. Reeves (editors). The bottlenose dolphin. Academic Press, San Diego. 653pp.

Baumgartner, M.F. 1997. The distribution of Risso's dolphin (*Grampus griseus*) with respect to the physiography of the northern Gulf of Mexico. Marine Mammal Science 13(4):614-638.

Beck, K.M., P. Fair, W. McFee and D. Wolf. *accepted.* Heavy metals in livers of bottlenose dolphins stranded along the South Carolina coast. Marine Pollution Bulletin.

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Bjorge, A., A.A. Hohn, T. Kvam, C. Lockyer, T. Schweder, H. Aarefjord. 1995. Report of the harbour porpoise age determination workshop, Oslo, 21-23 May 1990. Pages 478-493. In: Bjorge, A. And G. P. Donovan (eds.) Reports of the International Whaling Commission, Special Issue 16, Cambridge, UK.

Bossart, G.D., R. Ewing, A.J. Herron, C. Cray, B. Mase, S.J. Decker, J.W. Alexander, and N.H. Altman. 1997. Immunoblastic malignant lymphoma in dolphins: histologic, ultrastructural and immunohistochemical features. Journal of Veterinary Diagnostic Investigation 9(4):454-458.

Boveng, P.L., A.A. Hohn, D.P. DeMaster, A.E. Dizon, D.A. Hanan, and J.P. Scholl. 1989. Tracking harbor seals in southern California. Proceedings of the Argos Users Conference: 205-216.

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Chivers, S.J., A.A. Hohn, and R.B. Miller. 1989. Composition of the 1987 incidental kill of small cetaceans in the U.S. purse-seine fishery for tuna in the eastern tropical Pacific. Reports of the International Whaling Commission 39.

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Cowan, D.F. 1993. Lobo's disease in a bottlenose dolphin (*Tursiops truncatus*) from Matagorda Bay, Texas. Journal of Wildlife Disease 29(3):488-489.

Curry, B.E., and J. Smith. *in press*. Phylogeographic structure of the bottlenose dolphins, (*Tursiops truncatus*): Stock identification and implications for management. *In*: A.E. Dizon, S.J. Chivers, and W.F. Perrin (editors). Molecular genetics of marine mammals. Special Publication No. 3, The Society for Marine Mammalogy, 412pp.

D'Agrosa, C. O. Vidal, and W.C. Graham. 1995. Incidental mortality of the vaquita (*Phocoena sinus*) in gillnet fisheries during 1993-94. Pages 283-291 In: Bjorge, A. and G. P. Donovan (eds.) Reports of the International Whaling Commission, Special Issue 16, Cambridge, UK.

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Duignan, P.J., C. House, D.K. Odell, R.S. Wells, L.J. Hansen, M.T. Walsh, D.J. St. Aubin, B.K. Rima, and J.R. Geraci. 1996. Morbillivirus infection in bottlenose dolphin: evidence for recurrent epizootics in the western Atlantic and Gulf of Mexico. Marine Mammal Science 12(4):499-515.

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Lahvis, G.P., R. S. Wells, D.W. Kuehl, J.L. Stewart, H.L. Rhinehart, and C.S. Via. 1995. Decreased lymphocyte responses in free-ranging bottlenose dolphins (*Tursiops truncatus*) are associated with increased concentrations of PCB's and DDT in peripheral blood. Environmental Health Perspectives 103:67-72.

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