REPORT TO:

ASSISTANT ADMINISTRATOR FOR FISHERIES

PROGRAM REVIEW OF THE

MARINE MAMMAL STRANDING NETWORKS

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EXECUTIVE SUMMARY

To respond to beached and stranded marine mammals, Marine Mammal Stranding Networks have been set up in each of the National Marine Fisheries Service (NMFS) Regions. The programs have been independently operated out of each of the Regional Offices. The Networks are made up of volunteers who respond to strandings of both live and dead marine mammals under the jurisdiction of NMFS. In order to give them legal authority to respond, Network members are issued Letters of Authorization under Sections 109(h) and 112(c) of the Marine Mammal Protection Act (MMPA).

Network members rescue and rehabilitate live stranded animals. For all strandings, basic information is collected, including the person responding, the location, species, length, sex, condition, and disposition of the animal or carcass. Based on the recommendations of a 1977 workshop, these data are referred to as Level A data. The workshop also made recommendations for more detailed information. The information for Levels B and C data is not mandatory.

After treatment, live stranded animals are either restored to the wild or used for public display in lieu of a take from the wild. Dead stranded animals are an opportunistic source of tissues for those engaged in scientific research.

Since the Networks were set up in the early 1980s, there has not been a program review. Because of the decentralized nature of the Networks, operations are not uniform among the Regions. In addition, lack of funding and interest has meant that there has never been a systematic effort to improve the operation of the Networks and gain the maximum use of the data gathered.

The NMFS Office of Protected Resources initiated a program review in 1989. As a result of the program review a number of recommendations have emerged. They vary from recommendations for policy statements to suggestions for regulations to administrative changes and are summarized below.

RECOMMENDATIONS

1. A formal policy statement on Stranding Network operations should be issued. It should contain the following elements:

   A clear statement of Network goals.

   A statement that it is NMFS' policy that, whenever feasible, stranded animals returned to the water should be tagged.

   An unequivocal statement that rehabilitated animals will be used as a pool for public display animals where possible in lieu of taking such animals from the wild. It should include details on how placement of animals into permanent captivity will be handled.

   A statement that scientific research incidental to the treatment of stranded animals and research which is non-intrusive will be allowed during the rehabilitation process.

   A clarification of the relationship between scientific research permits and materials from marine mammal strandings.

2. A number of regulatory changes are recommended.

The regulatory language issued to provide for responses to stranding situations reflects an earlier version of the Act and does not contain language on Federal officials or for persons authorized under § 112(c) of the Act. The vast majority of Network members are private individuals operating under Letters of Authorization issued under § 112(c). The regulatory language should reflect this.

A regulation should be promulgated covering the handling and disposition of tissues from marine mammals including species that are listed under the Endangered Species Act (ESA). It should apply to both hard and soft parts. NMFS currently has no idea where the majority of tissues from stranded animals are. The regulation should clarify the authority of Network members to transfer tissues to researchers, museum collections, and educational institutions and have procedures for notification of such transfers.

Regulations covering the rehabilitation of live stranded marine mammals should be developed. They would include:

Minimum standards for rehabilitation facilities.

Provisions relating to the display of animals being rehabilitated.

3. In all Regions except the Northwest, legal authority to respond to strandings is provided through the issuance of Letters of Authorization. There are inconsistencies in the provisions of such Letters from Region to Region. Certain actions should be taken to provide for consistency among the Regions.

All Regions should use the same process.

A model Letter of Authorization should be developed. It should include:

Consistent requirements for reporting;

Conditions on collection of tissues from stranded marine mammals;

Requirements for prompt notification of Regional Offices when stranded animals are taken in for treatment and reporting of any change in the status of an animal;

Conditions on euthanasia;

Authority to dispose of carcasses;

Authority to tag animals when it is feasible;

A waiver of liability provision;

A termination date.

4. There are a series of administrative actions that could be taken which would improve Network operations.

There should be a NMFS employee in each Region whose primary responsibility is to handle Network activities.

The serious gap in reporting in the Southeast Region should be addressed.

Formal objective criteria need to be established for Network membership. NMFS needs to decide whether it should utilize specialists with a corresponding loss in coverage or allow non-specialists to supplement coverage with a loss in accuracy of some of the data. To the extent feasible, Network coverage should be limited to institutions. Institutions should be able to use volunteers and students if they operate under professional supervision.

NMFS should establish methods for evaluating performance of Network members and monitor performance.

To the extent feasible, lead organizations should be designated for geographic areas.

The regional stranding coordinators should identify and periodically contact local law enforcement agencies and agencies with jurisdiction over beach areas. Such agencies should be informed of the Networks, their purpose, and a contact point for responses. To the extent feasible, advance arrangements should be made for disposal of carcasses.

Contingency plans should be developed for significant stranding events.

Procedures should be in place for notification of public health and agricultural authorities if an epizootic should occur which could affect either humans or domestic animals.

A determination as to the releasability of a marine mammal being rehabilitated should be made within six months.

If Letters of Agreement continue to be used to place rehabilitated animals in public display facilities, a policy determination must be made as to whether such letters will be issued by the Regional offices or the central NMFS office.

Authority for decisions on whether to rescue free swimming marine mammals in-out-of-habitat situations, should be formally delegated to the Regional Directors.

A separate Letter of Authorization procedure should be set up for disentangling free swimming marine mammals.

5. If NMFS continues to rely on volunteers to provide information from strandings, it has a responsibility to ensure that the competence of Stranding Network members is at the highest possible level. An effort should be made to conduct training sessions and distribute materials to assist Network members. There are a number of areas in which there are identifiable information needs.

Network members should be informed of the chance of disease transmission or injury and of methods to reduce the risks.

In some areas, a species identification guide would be helpful.

A response protocol should be developed that includes the steps to be taken under different conditions, a list of equipment, and instructions on basic data collection.

A generic protocol on tissue collection, handling, and preservation should be developed and distributed to Network members. It should address what tissues can be usefully

collected at various stages of decomposition, and it should be appropriate for field conditions.

Any published protocols should be available on a continuing basis.

A bibliography of scientific publications resulting from research utilizing stranded animals should be prepared and made available to Network members.

NMFS should sponsor a workshop on treatment of live stranded marine mammals.

6. In order to make the data generated by strandings more useful, a number of steps should be considered.

The stranding report forms should be standardized.

Records should be kept of strandings when there is no response or an incomplete response.

Greater emphasis needs to be placed on verification of data through such things as collection of voucher specimens and taking photographs.

Each Region should make an attempt to quantify response rates and identify areas with consistent and complete coverage that can be used as index areas.

A data base on animals which have been tagged and released should be maintained.

A national data base on pinniped strandings should be created.

Human interactions should be moved up in importance. Instruction on identification of human interactions should be provided to Network members.

7. There are a number of areas in which NMFS could take action to improve the scientific information gained from strandings.

In conjunction with either a scientific meeting or the next national stranding workshop, NMFS should ask for a review of the definitions of Levels A, B, and C data.

An effort should be made periodically to identify information from stranded animals that would be useful for the agency's management responsibilities.

Active efforts should be made to encourage research on the physiology of live stranded cetaceans.

NMFS should fund a project to either satellite or radio tag cetaceans which are returned to the ocean at the site of a stranding.

In order to determine the utility of tissues from stranded animals and tissues that have been archived, controlled studies need to be conducted to determine the distribution of chemical compounds in various organs and to determine how time after death affects chemical constituents in various tissues.

8. NMFS should NOT attempt to finance basic Network participation. The Networks are made up of volunteers, and they should remain so. Recognizing that the volunteers do provide a service, the agency should be willing to fund various support and logistical

activities. A minimal and continuing investment in the Networks is likely to improve operations and improve the accuracy of information gained from strandings.

In order to carry out various support and contingency activities, a limited budget should be provided for each of the Stranding Networks.

Because major die-offs are inherently unpredictable and require large expenditures, a permanent fund to respond to such emergencies should be created. Such legislation should not be requested until NMFS regularizes its response to such situations.

Although NMFS should not provide funding for routine stranding responses, there are certain types of strandings for which the agency should assume some of the costs. If a significant stranding occurs when tissues can contribute to important information needs, the agency should be willing to pay for the collection, preservation, and shipment of tissues. NMFS also should be willing to assume a portion of the cost for mass strandings. Finally, if the agency asks people to respond outside of their normal geographic region, it should be willing to reimburse some of the expenses.

Arrangements should be made so that funds can be released in an expeditious manner. A stranding response requires immediate action. At best, the current contracting system is unwieldy.

9. NMFS should take every opportunity to recognize the efforts of the volunteers who make up the Stranding Networks.

INTRODUCTION

With the passage of the Marine Mammal Protection Act (MMPA) in 1972, it became public policy that the Federal government would assume an affirmative role in the protection of marine mammals. Almost immediately questions were raised as to the disposition of beached and stranded marine mammals. Issues such as responsibility for strandings, disposition of live animals, and salvage of parts from dead animals all had to be addressed.

Prior to the passage of the Act and for a few years afterward, informal networks operated to respond to stranding events. Respondents included state wildlife agencies, academic institutions and aquaria. In 1977, the Marine Mammal Commission sponsored a workshop in Athens, Georgia, on marine mammal strandings. The workshop recommended that regionally organized stranding networks be set up. Soon after, networks to handle those species under the authority of the Department of Commerce were set up to operate out of each of the regional offices of the National Marine Fisheries Service (NMFS). (See Appendix A for the addresses of the regional offices.)

NMFS regions are: the Northeast which covers the Atlantic coast from the Canadian border through Virginia, the Southeast which covers the Atlantic and Gulf of Mexico coasts from the Virginia-North Carolina border to the Mexican border in Texas (including Puerto Rico and the Virgin Islands), the Southwest which covers the coasts of California and Hawaii, the Northwest which covers the coast of Washington and Oregon, and Alaska which covers the coast of Alaska.

Each of the regions has set up its own procedures for dealing with strandings. In part this has been due to differences in such events among the regions. In some areas Network participants deal primarily with cetaceans. In others, the majority of strandings are pinnipeds.

In addition, there are differences in the structure of state and local governments and the availability of non-governmental participants. In New England, the Network may have to deal with various towns while the State government handles more of the functions in Washington and Oregon. In Alaska, the dearth of private institutions means that Network participants are almost exclusively State and Federal employees.

The regionalization of responsibility for the Marine Mammal Stranding Networks has permitted a degree of flexibility. Such flexibility is important if the Networks are to operate effectively. However, regionalization has also resulted in some inconsistencies among regions which have generated some criticism. Although the maximum amount of flexibility should be maintained, some activities common to each of the Networks should be consistent among the regions. These activities should be within the context of general policies that are consistent among the regions.

There has not been a comprehensive review of the Networks since their inception. In recent years there has been increasing public attention to strandings and stranding-related activity, and public reaction has varied from positive to negative. Within the last couple of years there have been:

a die-off of a large number of animals from the coastal Atlantic stock of bottlenose dolphins;

a smaller event involving humpback whales in the northeast;

an interest in wildlife mortalities following the Exxon Valdez catastrophe;

the successful restoration to the wild of three live stranded pilot whales after a period of rehabilitation;

a controversy over the disposition of a single bottlenose dolphin which had entered a facility for rehabilitation after stranding;

an effort to ban gillnets in State waters off the coast of California following strandings of entangled harbor porpoises and gray whales; and

several events which do not technically qualify as strandings but are perceived as such by the general public, e.g., Humphrey, the humpback whale in the Sacramento River, three gray whales trapped in the ice off the North Slope of Alaska, and a bottlenose dolphin near Virginia Beach, Virginia, which failed to migrate south at the beginning of the winter.

In each instance, public concern to some degree has precipitated agency action. At a time when there is increasing public awareness of stranding events, it is appropriate to review procedures.

The operation of the Network can affect other agency responsibilities. It can impinge on the issuance of both public display and scientific research permits under the MMPA. The Networks can also serve as a source of information for management responsibilities for fisheries and marine mammals.

Early in 1989, James W. Brennan, the Assistant Administrator for Fisheries, asked the Office of Protected Resources to conduct a review of its stranding policies and programs to ensure that there is consistency in its approach to handling strandings and that, to the extent feasible, the goals of the Networks are met.

The goals of the review were to determine how the Networks are currently operating, evaluate the operations, serve as a mechanism for cross-fertilization of ideas, and to offer suggestions and recommendations to help NMFS make the operation of the Networks even more effective.

The review was assigned to Dean Wilkinson of the Office of Protected Resources. The review involved a review of all records relating to strandings in both the Central Office and each of the Regional Offices and a review of the professional literature. Interviews were conducted with NMFS personnel and Stranding Network members in each of the Regions. In addition, meetings were held in the Southeast and Southwest Regions to allow Stranding Network members to address issues in an open forum. The Northeast Region wrote to each of their members and asked them to address a series of issues. A number of individuals from various areas took the time to provide extensive written comments.

This paper is the product of the review. It contains recommendations for policy statements, guidelines, and regulations. The report is intended to generate further discussion, and input from those with an interest in the topics presented is both welcome and actively solicited.

Prior to discussing issues involving the Networks, some operational definitions are needed. Although it would seem to be obvious, a definition of "stranding" is in order. The 1977 marine mammal stranding workshop provided a working definition:

> "All marine mammals found along a shoreline are referred to as 'stranded,' although a distinction must be made between those which come ashore alive and those which are simply washed ashore dead. The amphibious pinnipeds and sea otters are considered to be stranded when unable to leave the shore because of accident,

parasitism or disease. Weak and malnourished seal pups and young sea otters often strand following abandonment or separation from the female parent." (Geraci and St. Aubin, 1979).

The California Marine Mammal Stranding Network has provided the following definition of stranding to its members.

> "Any dead marine mammal on a beach or floating nearshore is considered to be 'stranded'. A marine mammal out of its element is considered to be 'stranded'. Therefore, any live cetacean on the beach is considered to be 'stranded'. Aside from regular haulout or breeding sites, live pinnipeds that haulout on coastal California beaches subject to frequent or habitual human use are considered to be 'stranded'. Pinnipeds hauled out in more remote areas require a 24-48 hour observation period before being considered to be 'stranded'. This allows an animal time to rest and to return to the sea on its own." (Seagars et al., 1986).

There are pragmatic elements to the latter definition specific to California circumstances which may make it inappropriate for a general definition. As will be discussed below, there are instances when an animal may be out of its element and not be technically stranded. There have been instances when cetaceans have strayed up rivers. While such animals may have been out of their element, distressed, and in need of rescue, there are some practical reasons why defining free swimming animals as "stranded" is inappropriate in the context of a stranding network. In the case of pinnipeds, I prefer the more general definition of the workshop. The additional clarification provided for California is a means for determining when an animal is unable to return to the sea.

For an operational definition, the following definition is proposed:

> "A stranded marine mammal is:
> Any dead marine mammal on a beach or floating nearshore;
> Any live cetacean on a beach or in water so shallow that it is unable to free itself and resume normal activity; or
> Any live pinniped which is unable or unwilling to leave the shore because of injury or poor health."

Several types of strandings will be referred to throughout the paper. The most obvious dichotomy is between live and dead stranded animals. In the case of dead animals, the stranding response is focused on disposal of the remains and obtaining information and specimen material for scientific analysis.

The initial response to live strandings differs between pinnipeds and cetaceans. For pinnipeds, in many instances, the initial response should be one of observation in order to ascertain whether the animal is debilitated and unable to return to the sea.

In the case of live stranded cetaceans, an immediate response is critical. There are two types of live cetacean strandings: single and mass strandings. In the case of single strandings, generally an animal is so ill or injured that recovery is unlikely.

Although it is tempting to use the definition of "mass stranding" proposed by Robson (1984), i.e., more than three animals, the definition of more than two animals is so commonly accepted that it will be used here. Single strandings include pairs of animals in order to account for strandings when a mother and a calf strand together.

Mass strandings are almost exclusively of offshore species of odontocetes. The literature contains one reference to a mass stranding of mysticetes in the late Nineteenth Century (cited in Wood in Geraci and St. Aubin, 1979). There have been mass strandings of coastal

species such as orcas and bottlenose dolphins (Oritsland and Christensen, 1982; Robson, 1984), but they are rare. One hypothesis which attempts to account for this points out that coastal species are more likely to be familiar with shorelines and less likely to strand. Indeed, both orcas (Lopez and Lopez, 1985) and bottlenose dolphins (Hoese, 1971, and Oceanic Research Communication Alliance, 1988) have been observed to deliberately strand while pursuing prey and then successfully regain the water. Although there is some dispute (Odell, 1987), there is a body of evidence that at least some animals in a mass stranding may be relatively healthy, although the combination of stress, hyperthermia, and dehydration can quickly alter their physical status.

There is another type of stranding which may well be a subcategory of either single or mass strandings. There have been instances when unusual tidal events have resulted in strandings, and animals have either swum off at the next high tide or been rescued.

NMFS issues two types of letters which deal with strandings or stranded animals which have been rehabilitated. These letters are referred to, often interchangeably, as Letters of Authorization and Letters of Agreement. For the sake of clarity, "Letter of Authorization" will be used to refer to the document that allows an individual or organization to participate in a stranding network. "Letter of Agreement" will be used for the document that allows permanent care and maintenance of a rehabilitated animal which cannot be returned to the wild. A Letter of Agreement may be issued to enable a facility to retain an animal it has rehabilitated or to transfer that animal to another facility.

Efforts to save animals and to generate scientific knowledge are almost exclusively due to the voluntary dedication of thousands of people who receive no payment for their efforts. The participants are motivated by their concern for marine mammals and their desire to gain scientific knowledge. From the perspective of the agency, we have benefitted from individuals who have been willing to donate both time and money to make the Networks work. During several interviews the author was told that nobody had even bothered to say "Thank you." It is appropriate to express a debt of gratitude on behalf of the agency. Much has been learned as a result of the activities of the Networks. To have done everything which was performed by the Networks would literally have been impossible if it had been done exclusively by the agency and would have required millions of dollars.

There is another group without which the Networks could not operate and which has never received acknowledgement. That group is the law enforcement officers and beach authorities who make initial contact with the participants of the Networks. They are the people who are called when someone discovers an animal on the beach, and without their cooperation, the Networks would not be able to operate.

Special thanks are in order to Dr. James Mead of the Smithsonian Institution and the Cousteau Society. If the Networks have a father, it is Dr. Mead. Although institutions such as the Los Angeles County Museum began to systematically record marine mammal strandings in the early 1960s, he had the vision and endurance needed to set up a national system to record strandings. He has continued to provide much of the impetus behind the Networks, and still compiles all cetacean stranding reports in the United States as part of the Marine Mammal Events Program. Dr. Mead has been accessible and willing to share his knowledge with anyone who has sought his guidance. The Cousteau Society deserves recognition for providing funding on a continuing basis to Dr. Mead and for providing seed money to the regional Stranding Networks soon after they were formalized.

The reader should be aware that the author has certain biases. These predispositions may possibly have influenced some recommendations; therefore, it is only fair that they are listed openly.

Where possible, the author believes it is preferable not to unduly restrict Network members with regulations. By trying to establish rules for every eventuality, an agency can actually inhibit the action it desires. Individuals may become more concerned with following rules than with accomplishing the purpose for which the Networks were established. Because the Stranding Networks are operated by volunteers, this issue becomes critical. Informal channels have already been set up for specific activities, and while they may frustrate bureaucrats, they are the product of trial and error, i.e., if something works, do it. The author believes policy statements and guidelines are preferable to regulations whenever they can serve the purpose. Although the author would contest the statement in its original context, he agrees with a statement made by T.H. Huxley, "I think that the man who has made the unnecessary law deserves a heavier punishment than the man who breaks it" (Quoted in Royce, 1989).

As a related principle, one should be guided by the statement, "If it ain't broke, don't fix it." It should be noted, however, that not a single individual said that nothing could be done to improve the Networks. Some of their suggestions may be achievable, others are clearly in the realm of what might be done in an ideal world.

The author also believes that a maximum amount of information should be gained from dead stranded animals. To achieve such a goal, materials should be readily available to researchers as long as activities are consistent with the goals and purposes of the MMPA. Dead stranded animals represent an opportunistic source of information about marine mammals which might not be otherwise available without sacrificing animals. Certainly maximum utilization of materials for scientific research is in keeping with the goals and purposes of the Act as long as the materials do not enter into commerce.

The author also has a preference for membership to be inclusive rather than exclusive. One of the goals of the Networks should be to get as close as possible to a 100 percent response rate to reports of strandings. If the involvement of additional members will achieve that goal and improve the chances for recovery of live stranded animals and produce reliable data, certainly it should be considered. Such a principle does not imply that people be employed in activities where they are not competent or that no guidelines should exist for participants. Nor does it mean that people who are not reliable in responding or produce questionable data should not be removed from the Networks. As one individual succinctly put it, "No data are better than erroneous data."

Finally, the author believes in the best operation at the least cost. Of necessity, funds have been limited, but efficiency and frugality are not mutually exclusive. For this reason, the author believes that the basic structure of the Networks should be retained.

Acknowledgements: Many people have been more than willing to respond to specific questions which were raised in the course of the review. Their openness, patience, and guidance is genuinely appreciated.

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Sherry Pearson of the National Marine Mammal Library was extremely helpful in locating scientific papers and responding to requests which were not always reasonable.

Finally, three individuals helped edit the first draft of the report. Aleta Hohn, Charles Karnella, and Robert Hofman all improved the clarity of the final draft and saved the author from unnecessary errors.

BACKGROUND

Beached and stranded marine mammals have a fascination for the general public. A stranding event is likely to draw a crowd, and strandings of large cetaceans or mass strandings are likely to receive extensive local press coverage. Often well-meaning and misguided attempts may be undertaken to "rescue" live stranded animals. Each year members of the public remove healthy seal pups which they feel have been abandoned when their mothers have only temporarily left them. This has necessitated a "Leave them alone" publicity campaign in the northeast and on the Pacific coast. At other times, members of the public have attempted to put stranded live cetaceans back into the water when they are likely to restrand or die. Single stranded cetaceans have usually been weakened by disease, parasitism, or injury to the point where they are unlikely to survive. In both single and mass stranding situations, the animals have a frustrating propensity to restrand (Caldwell et al., 1970; Fehring and Wells, 1976; Mead et al., 1980; Odell et al., 1980; and Whiteside, 1988).

Stranding events have a different type of interest for scientists and researchers. They provide an opportunistic source of information on animals which are not normally readily accessible. Much of the morphology and life history on particular species has come from stranded animals. In the case of rare species, the only information may have come from strandings. A single individual has often been able to provide new information on the morphology of a number of species, ranges of species, and provide evidence that an individual species may be more common than previously assumed. As an example, one dedicated individual combing the beaches in Tierra del Fuego has contributed in each of these areas. Also, the cumulative record may provide evidence on population dynamics.

Records of cetacean strandings have been maintained in a number of countries (International Whaling Commission, 1986). The longest series of records has been compiled by the British Museum of Natural History which began to record such events systematically in 1913. Such historic records can still be used to indicate geographical or seasonal tendencies in strandings and possibly provide indirect evidence of population trends (Klinowska 1985a; Smeenk, 1987). Stranding networks exist in the United Kingdom, France (Royal Society for the Prevention of Cruelty to Animals, 1985) the Netherlands (Broekma, 1987; Smeenk, 1987), South Africa, Australia, and New Zealand.

Basic protocols for the rescue of stranded cetaceans have been developed in several places (Royal Society for the Prevention of Cruelty to Animals, 1985; International Fund for Animal Welfare, n.d.). Detailed protocols have been developed in New Zealand (Anon. 1987), Australia (Anon. 1984), and by some of the facilities responding to strandings in the United States (California Marine Mammal Center, 1986). In the United Kingdom, the Netherlands, and the United States, facilities exclusively engaged in the rehabilitation of marine mammals and supported by private funds have been established. In addition, several aquaria in the United States have established extensive rehabilitation programs. The programs operated by rehabilitation facilities and aquaria have provided information on, among other things, diseases affecting marine mammals.

STRANDINGS IN THE UNITED STATES

Over the 5-year period ending in 1987, an annual average of approximately 1400 pinnipeds and 600 cetaceans have been reported as stranded on the coasts of the United States. The reader should be aware that there are limitations on the applications of such averages. First, the totals from which the averages are drawn are influenced by observer effect or

unit effort. As James Mead observed, there is more than one point in the process where an error can occur. "Once an animal has stranded, it has to first be noticed, second be reported, and third have the report recorded" (Mead in Geraci and St. Aubin, 1979). In the case of cetaceans, Dr. Mead's efforts have virtually eliminated the third problem. The other two areas continue to affect the data and the conclusions which can be drawn therefrom.

In the first area, increased public awareness has improved the response rate. This is illustrated by the reports from Florida. During the decade ending in 1987 the number of stranding reports doubled there. The Network Coordinator has attributed the increase to better Network coverage rather than an increase in the actual number of strandings. [Note: Rather than using an anomalous figure created by the unusually high mortality rate of Tursiops truncatus in 1987-88, in this instance I have employed the estimate of the Network Coordinator that the average annual number of cetacean stranding reports is in the range of 120. [(Odell, in Reynolds and Odell, in press and D. Odell, pers. comm., 1989)].

In the second area, the number is influenced by the willingness of Network members to respond. As is pointed out below, there is sometimes a reluctance to respond to strandings of common species which have stranded dead. In most areas, the response to dead cetacean strandings has been better than the response to dead pinniped strandings, but the number of cetacean strandings recorded is by no means complete.

There are other factors which affect the averages above. The pinniped figures are higher as a result of two anomalous events on the west coast. The number of stranded pinnipeds increased in 1983 due to severe weather conditions during the El Niño phenomenon and in 1984 due to a leptospirosis epizootic. If those two years are eliminated from the average, the annual number of pinnipeds stranded in the Southwest region would be reduced from 884 to 425. Epizootics, however, are periodic events. In 1947, 1970, 1984 and 1988, there were outbreaks of leptospirosis (Gage, 1989). Similarly, there was an epizootic caused by an influenza virus in 1980 affecting harbor seals (Geraci et al., 1982). During 1988, worldwide publicity was given to an epizootic affecting harbor seals and gray seals in the North Sea (Osterhaus and Vetter, 1988 and Mahy et al., 1988). To totally eliminate such events would artificially reduce the average. Being cognizant of the fact that the data are also influenced by unit effort, the author arbitrarily has decided to average the figures over a 5-year period rather than trying to use a single most recent year as a gauge of magnitude. It should also be noted that the figure represents strandings reported and does not purport to be a measure of the actual number of strandings.

In much the same fashion, the cetacean figures are influenced by the massive mortality of the mid-Atlantic coastal migratory stock of bottlenose dolphins in 1987-88. During an 11-month period, 742 animals were reported as stranded (Geraci, 1989). Again, what is presented is a 5-year annual average of stranding reports.

The agency makes little effort to systematically record stranding data on pinnipeds in an accessible form. Only one region has entered pinniped stranding reports into a data base. Another region was unable to provide even totals of strandings without going back to individual Network participants--some of whom fortunately have kept detailed records. When queried as to how they would detect an epizootic, one individual rather ruefully observed, "We would have to check with (a private facility in the Network)." In another region, when asked for a level of detail beyond species, the individual responded that there was no way of doing so without going back and compiling each of the individual stranding reports.

By region, the 5-year annual average for pinniped strandings is: Northeast--113, Northwest--404, and Southwest--884. Although strandings of pinnipeds have occasionally been recorded in the Southeast, such events are very unusual. Because of the massive

geographic area and the shortage of people to respond, the Alaska Region makes no effort to record pinniped strandings except when anomalous events occur. Occasionally, an animal has been taken in for rehabilitation, and an effort was made to monitor harbor seals following the Exxon Valdez oil spill.

Table 1 provides a compilation of stranding reports by species, by year on the west coast. Enough uncertainty existed in the stranding records of the Northeast Region that no effort was made to stratify the stranding reports by species. Because the New England Aquarium responds to the vast majority of strandings, and they have provided detailed records, one can generalize, however, that over 90 percent of stranded pinnipeds in the Northeast Region are harbor seals (Phoca vitulina). In each of the last four years, between two and six gray seals (Halichoerus grypus) and at least one hooded seal (Cystophora cristata) have stranded each year. In addition, there has been an occasional harp seal (Phoca groenlandica) stranding.

The data record on stranded cetaceans is much more accessible because of the continuing efforts of Dr. James Mead of the Smithsonian Institution. He started compiling stranding reports in 1972. Each quarter, he distributes a report summarizing records of cetacean strandings as part of the Marine Mammal Events Program. The report gives details on each cetacean stranding event corresponding to the entry on the stranding report forms.

During the 6-year period 1983-88, the Smithsonian's Marine Mammal Events Program received 3,768 reports of cetacean stranding events. The annual average was 628 reports. It should be noted that the total is of reports received and that a mass stranding shows as a single report. As in the case of pinnipeds, a major mortality event influences the average. During 1987-88, there was a mass mortality of bottlenose dolphins (Tursiops truncatus). By year, the totals were:

1983 ------	372
1984 ------	478
1985 ------	455
1986 ------	548
1987 ------	1,183
1988 ------	732

Table 2 shows the annual number of reports by species in each of the Regions. As with pinnipeds, more than half the cetacean reports are from a single Region. Over the period, the reports by Region were 2014 in the Southeast Region, 978 in the Northeast, 474 in the Southwest, 193 in the Northwest, and 109 in Alaska. The totals for Alaska reflect the relatively sparse coverage of a large coast.

The most commonly stranded cetacean species is the bottlenose dolphin (Tursiops truncatus) with 2,081 events. In each of the years Tursiops strandings as more than twice as common as the second most common species, harbor porpoises (Phocoena phocoena). The species with an average of more than ten reports a year were:

Harbor porpoise (Phocoena phocoena)	385
Common dolphin (Delphinus delphis)	148
Pygmy sperm whale (Kogia breviceps)	471

Gray whale (Eschrichtius robustus)	125
Atlantic whitesided dolphin (Lagenorhynchus acutus)	87
Humpback whale (Megaptera novaeangliae)	65
Long finned pilot whale (Globicephala melaena)	64

For the most part, the number of stranding reports corresponds to the number of animals stranding. The totals may be slightly below actual figures because of incidents such as cow-calf strandings. The major discrepancy between reports and actual numbers of stranded animals is for species which mass strand. The species which are most affected are long finned pilot whales (Globicephala melaena) and Atlantic whitesided dolphins (Lagenorhynchus acutus) in the Northeast and short finned pilot whales (Globicephala macrorhynchus) and false killer whales (Pseudorca crassidens) in the Southeast. The largest discrepancy between the totals is in the case of long finned pilot whales. There were 62 events reported during this period. The New England Aquarium totals for individual animals during the same period was 234.

Having indicated some of the shortcomings of the data, it must be emphasized that they do have utility, and the pessimism expressed by Klinowska is not always warranted. She wrote, "Such reporting schemes are, in fact, as much a record of observer activity as of cetacean activity" (Klinowska, 1985). It should be emphasized that in many areas there is almost a total response rate. The accumulated data are good enough that unusual events are detectable. As an example, because of past records, it was apparent very early that a problem existed when the die-off of bottlenose dolphins began on the east coast. Stranding data cannot be used for many things, e.g., it may be impossible to factor them into total mortality figures other than in the grossest fashion because of the uncertainties of tides and currents. Once an adequate baseline is established, however, they can certainly be used as an indicator of problems and trends.

WEST COAST PINNIPED STRANDINGS REPORTED FROM 1983 THROUGH 1987

SPECIES	1983	1984	1985	1986	1987	TOTAL
California sea lion *Zalophus californianus*	1783	794	308	219	231	3335
Harbor seal *Phoca vitulina*	346	413	294	408	160	1621
Northern elephant seal *Mirounga angustirosotris*	252	107	106	213	83	761
Northern sea lion *Eumetopias jubatus*	26	24	19	8	9	86
Northern fur seal *Callorhinus ursinus*	26	6	10	2	3	47
Guadalupe fur seal *Arctocephalus townsendi*	0	1	0	0	0	1
Hawaiian monk seal *Monachus schauinslandi*	0	0	0	1	1	2
Unidentified	45	353	154	93	55	700
TOTAL	2478	1698	891	944	542	6553

ALASKA CETACEAN STRANDINGS REPORTS FROM 1983 THROUGH 1988

SPECIES	1983	1984	1985	1986	1987	1988	Total
Minke whale **Balaenoptera acutorostrata**	-	-	-	2	3	1	6
Blue whale **Balaenoptera musculus**	-	-	-	-	-	1	1
Fin whale **Balaenoptera physalus**	-	1	1	-	-	-	2
Baird's beaked whale **Berardius bairdii**	-	-	1	1	-	-	2
Beluga whale **Delphinapterus leucas**	-	1	1	1	2	2	7
Gray whale **Eschrichtius robustus**	-	1	-	1	6	5	13
Pacific whitesided dolphin **Lagenorhynchus obliquidens**	-	1	-	-	-	-	1
Humpback whale **Megaptera novaeangliae**	-	1	3	2	12	5	23
Stejneger's beaked whale **Mesoplodon stejnegeri**	-	-	-	2	1	1	4
Killer whale, orca **Orcinus orca**	-	2	3	2	2	2	11
Harbor porpoise **Phocoena phocoena**	-	-	1	-	1	10	12

ALASKA continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
Dall's porpoise **Phocoenoides dalli**	-	-	-	1	-	-	1
Sperm whale **Physeter catodon**	-	-	1	6	1	2	10
Spotted dolphin **Stenella attenuata**	1	-	-	-	-	-	1
Cuvier's beaked whale **Ziphius cavirostris**	-	1	4	-	2	1	8
Unidentified mysticete	-	-	-	-	-	2	2
Unidentified odontocete	-	-	-	-	2	-	2
Unidentified cetacean	-	-	-	-	1	2	3
Total	1	8	15	18	33	34	109

Data provided by James Mead, Marine Mammal Events Program, Smithsonian Institution

NORTHEAST CETACEAN STRANDING REPORTS FROM 1983 THROUGH 1988

SPECIES	1983	1984	1985	1986	1987	1988	Total
Minke whale **Balaenoptera acutorostrata**	1	4	7	1	7	4	24
Fin whale **Balaenoptera physalus**	13	3	3	4	3	8	34
Beluga whale **Delphinapterus lencas**	1	-	-	1	1	-	3
Common dolphin **Delphinus delphis**	9	2	19	10	7	3	50
Right whale **Eubalaena glacialis**	2	1	1	3	-	-	7
Short finned pilot whale **Globicephala macrorhynchus**	2	-	-	1	-	-	3
Long finned pilot whale **Globicephala melaena**	7	12	7	12	8	16	62
Grampus **Grampus griseus**	2	1	3	2	-	-	8
Pygmy sperm whale **Kogia breviceps**	4	-	8	4	3	-	19
Dwarf sperm whale **Kogia simus**	-	-	3	-	-	-	3
Atlantic whitesided dolphin **Lagenorhynchus acutus**	15	16	10	10	30	5	86

NORTHEAST continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
White beaked dolphin **Lagenorhynchus albirostris**	-	-	-	2	-	-	2
Humpback whale **Megaptera novaeangliae**	-	3	6	5	15	5	34
Blainville's beaked whale **Mesoplodon densirostris**	-	-	-	1	-	-	1
Gervais' beaked whale **Mesoplodon europaeus**	1	-	1	1	-	-	3
True's beaked whale **Mesoplodon mirus**	1	-	1	-	-	-	2
Killer whale, orca **Orcinus orca**	-	-	-	1	-	-	1
Melonheaded whale **Peponocephala electra**	-	1	-	-	-	-	1
Harbor porpoise **Phocoena phocoena**	4	11	17	20	44	16	112
Sperm whale **Physeter catodon**	1	-	2	-	1	2	6
Spotted dolphin **Stenella attenuata and Stenella frontalis**	2	1	-	-	1	3	7
Striped dolphin **Stenella coeruleoalba**	7	1	9	3	2	5	27

NORTHEAST continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
Bottlenose dolphin **Tursiops truncutus**	10	24	20	22	360	27	463
Cuvier's beaked whale **Ziphius cavirostris**	1	-	-	1	-	1	3
Unidentified mysticete	-	-	3	-	-	5	8
Unidentified pilot whale	-	-	1	-	1	-	2
Unidentified delphinid	-	-	-	1	4	-	5
Unidentified odontocete	-	-	-	-	1	-	1
Unidentified cetacean	-	1	-	-	-	-	1
Total	83	81	121	105	488	100	978

Data provided by James Mead, Marine Mammal Events Program, Smithsonian Institution

NORTHWEST CETACEAN STRANDINGS REPORTS FROM 1983 THROUGH 1988

SPECIES	1983	1984	1985	1986	1987	1988	Total
Minke whale **Balaenoptera acutorostrata**	-	1	2	1	1	1	6
Fin whale **Balaenoptera physalus**	-	-	-	1	-	-	1
Common dolphin **Delphinus delphis**	1	-	1	-	-	-	2
Gray whale **Eschrichtius robustus**	8	15	2	2	9	10	46
Grampus **Grampus griseus**	-	-	1	-	1	1	3
Pygmy sperm whale **Kogia breviceps**	-	1	1	-	-	-	2
Pacific whitesided dolphin **Lagenorhynchus obliquidens**	5	4	-	1	-	1	11
Hubb's beaked whale **Mesoplodon carlhubbsi**	-	-	-	-	-	2	2
Stejneger's beaked whale **Mesoplodon stejnegeri**	-	-	-	2	1	-	3
Killer whale, orca **Orcinus orca**	1	-	-	-	1	1	3
Harbor porpoise **Phocoena phocoena**	6	14	19	11	21	15	86

NORTHWEST continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
Dall's porpoise **Phocoenoides dalli**	1	3	2	3	2	3	14
Sperm whale **Physeter catodon**	-	-	1	1	-	-	2
False killer whale **Pseudorca crassidens**	-	1	-	-	1	-	2
Bottlenose dolphin **Tursiops truncatus**	-	-	-	-	-	2	2
Cuvier's beaked whale **Ziphius cavirostris**	2	1	-	2	2	-	7
Unidentified mesoplodon	-	1	-	-	-	-	1
Total	24	41	29	24	39	36	193

Data provided by James Mead, Marine Mammal Events Program, Smithsonian Institution

SOUTHEAST CETACEAN STRANDINGS REPORTS FROM 1983 THROUGH 1988

SPECIES	1983	1984	1985	1986	1987	1988	Total
Minke whale **Balaenoptera acutorostrata**	-	-	-	-	1	2	3
Bryde's whale **Balaenoptera edeni**	1	-	1	1	1	1	5
Fin whale **Balaenoptera physalus**	-	1	-	-	1	1	3
Common dolphin **Delphinus delphis**	-	-	-	-	-	1	1
Right whale **Eubalaena glacialis**	1	-	-	-	-	1	2
Pygmy killer whale **Feresa attenuata**	4	-	-	-	-	2	6
Short finned pilot whale **Globicephala macrorhynchus**	2	-	5	3	5	-	15
Long finned pilot whale **Globicephala melaena**	-	-	-	-	1	1	2
Grampus **Grampus griseus**	4	5	5	2	2	2	20
Pygmy sperm whale **Kogia breviceps**	32	18	22	23	14	10	119
Dwarf sperm whale **Kogia simus**	3	11	9	4	6	3	36

SOUTHEAST continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
Atlantic whitesided dolphin **Lagenorhynchus acutus**	-	-	-	-	1	-	1
Humpback whale **Megaptera novaeangliae**	1	-	1	3	-	-	5
Sowerby's beaked whale **Mesoplodon bidens**	-	1	-	-	-	-	1
Blainville's beaked whale **Mesoplodon densirostris**	-	2	1	1	-	-	4
Gervais' beaked whale **Mesoplodon europaeus**	3	2	3	2	2	4	16
True's beaked whale **Mesoplodon mirus**	-	-	-	2	-	-	2
Harbor porpoise **Phocoena phocoena**	-	2	1	1	12	-	16
Sperm whale **Phyester catodon**	4	-	4	4	2	2	16
False killer whale **Pseudorca crassidens**	-	-	-	3	3	1	7
Spotted dolphin **Stenella attenuata and Stenella frontalis**	9	1	4	4	8	2	28
Clymene dolphin **Stenella clymene**	2	2	3	4	4	-	15

SOUTHEAST continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
Striped dolphin **Stenella coeruleoalba**	1	-	5	1	1	2	10
Spinner dolphin **Stenella longirostris**	3	1	1	1	1	1	8
Rough toothed dolphin **Steno bredanensis**	-	-	1	2	1	1	5
Bottlenose dolphin **Tursiops truncatus**	121	174	134	263	466	426	1584
Cuvier's beaked whale **Ziphius cavirostris**	1	3	1	4	2	1	12
Unidentified Kogia	1	1	1	1	1	-	5
Unidentified pilot whale	-	-	-	-	1	1	2
Unidentified mesoplodon	-	-	-	1	-	-	1
Unidentified delphinid	5	3	6	2	2	5	23
Unidentified odontocete	-	-	1	-	3	-	4
Unidentified cetacean	-	5	-	2	-	17	24
Unidentified mysticete	-	-	-	-	13	-	13
Total	198	232	209	334	554	487	2014

Data provided by James Mead, Marine Mammal Events Program, Smithsonian Institution

SOUTHWEST CETACEAN STRANDINGS REPORTS FROM 1983 THROUGH 1988

SPECIES	1983	1984	1985	1986	1987	1988	Total
Minke whale **Balaenoptera acutorostrata**	-	1	-	-	-	1	2
Blue whale **Balaenoptera musculus**	-	1	-	2	1	3	7
Fin whale **Balaenoptera physalus**	1	-	-	-	-	1	2
Common dolphin **Delphinus delphis**	4	22	18	15	15	21	95
Gray whale **Eschrichtius robustus**	3	13	15	6	22	7	66
Short finned pilot whale **Globicephala macrorhynchus**	-	1	-	1	1	1	4
Grampus **Grampus griseus**	-	-	1	-	-	7	8
Pygmy sperm whale **Kogia breviceps**	1	3	1	1	-	1	7
Dwarf sperm whale **Kogia simus**	-	-	-	-	2	-	2
Pacific whitesided dolphin **Lagenorhynchus obliquidens**	3	9	6	2	4	4	28
Northern right whale dolphin **Lissodelphis borealis**	-	-	-	-	-	1	1

SOUTHWEST continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
Humpback whale **Megaptera novaeangliae**	-	-	-	1	2	-	3
Hubb's beaked whale **Mesoplodon carlhubbsi**	-	2	1	1	-	-	4
Blainville's beaked whale **Mesoplodon densirostris**	-	1	1	-	-	-	2
Killer whale, orca **Orcinus orca**	-	-	1	-	-	1	2
Melonheaded whale **Peponocephala electra**	-	-	1	1	-	-	2
Harbor porpoise **Phocoena phocoena**	42	45	27	19	12	14	159
Dall's porpoise **Phocoenoides dalli**	-	4	-	1	3	1	9
Sperm whale **Phyester catodon**	-	2	1	1	-	2	6
False killer whale **Pseudorca crassidens**	1	-	-	1	-	-	2
Spotted dolphin **Stenella attenuata**	-	-	-	1	1	-	2
Striped dolphin **Stenella coeruleoalba**	1	1	-	4	-	-	6

SOUTHWEST continued

SPECIES	1983	1984	1985	1986	1987	1988	Total
Spinner dolphin **Stenella longirostris**	-	-	-	-	-	1	1
Rough toothed dolphin **Steno bredanensis**	2	-	-	-	1	-	3
Bottlenose dolphin **Tursiops truncatus**	4	4	7	5	5	7	32
Cuvier's beaked whale **Ziphius cavirostris**	1	2	1	-	-	1	5
Unidentified delphinid	2	-	-	-	-	-	2
Unidentified odontocete	1	-	-	-	-	-	1
Unidentified cetacean	-	5	-	-	-	1	6
Unidentified mysticete	-	-	-	5	-	-	5
Total	66	116	81	67	69	75	474

Data provided by James Mead, Marine Mammal Events Program, Smithsonian Institution

MEMBERSHIP IN THE NETWORKS

Because of major differences in the way membership is handled by each of the regions, a national total of membership in the Networks would be meaningless. It should be noted, however, that throughout the country thousands of individuals participate, and institutions such as State and local governments, aquaria, museums, academic institutions, research organizations, and nonprofit organizations play key roles. What follows is a description of membership in each Region taken from their stranding directories with the exception that governmental entities have not been added. As is discussed below, State and local governments have concurrent jurisdiction over strandings, and while their cooperation has been vital to the success of the Networks, they do not go through a membership process.

The Northeast Region limits membership to institutional entities which are responsible for entire states. Those who respond to strandings are either personnel of the institution or operate under its authority. In some places, there is a formal sub-designation. In others, individuals act as volunteers working with the institution. To cite just one example, the New England Aquarium is the designee for the State of Massachusetts, but an organization has been set up on Cape Cod to assist them in mass stranding situations. The Cape Cod Stranding Network lists over 500 potential volunteers. Current members of the Northeast Marine Mammal Stranding Network are three aquaria, two academic institutions, one research foundation, and one nonprofit organization set up explicitly to respond to strandings. The Smithsonian Institution should be added to the list. Although it does not operate under the same conditions as other members, it responds to a large number of cetacean strandings.

In the Southeast Region, all of the members of the Stranding Network are individuals, and several individuals at a single institution may hold Letters of Authorization. 120 private individuals are listed whose affiliations are:

42 from 15 public display facilities
30 from 19 academic institutions
19 from 5 private research facilities
7 from 4 environmental organizations
4 from 2 nature/wildlife centers
18 whose affiliation is not listed but several of whom are listed as veterinarians.

Despite the contrast with the small number of institutional members in the Northeast, the list of individuals is by no means exhaustive. Several individuals commented that they use graduate students or other volunteers to help them in responses. The list also does not contain a large number of individuals employed by either State or Federal agencies. As an example of the importance of governmental entities, Texas has regionalized its Network, and of the six regions, lead organizations in three of them are the United States Fish and Wildlife Service, the Texas Department of Parks and Wildlife, and the United States National Park Service.

In California, the Southwest Region has divided the response to stranding events by geographic region and function. The list of respondents is divided into those who respond to live cetacean strandings, live pinniped strandings, dead cetaceans, and dead pinnipeds. There has been a conscious effort to involve both State and county agencies in the Network. The directory includes contact numbers for animal control agencies, park personnel, and beach authorities. The Network contains 45 private entities. They include:

7 academic institutions;
7 animal rescue and/or rehabilitation centers;

6 Humane Societies or branches of the Society for Prevention of Cruelty to Animals;
5 aquaria;
4 research institutions;
4 museums;
3 private animal shelters;
3 wildlife sanctuary or conservancy areas;
2 environmental organizations; and
4 other organizations.

Each of the memberships in California is institutional, covering employees and volunteers working under the authority of the institution. Thousands of individuals are either directly or indirectly involved, ranging from lifeguards to the 350 volunteers at the California Marine Mammal Center to graduate students to individuals working with county waste disposal agencies.

For the most part, responses to strandings are handled by State and Federal personnel in Hawaii, although private aquaria have assisted with live stranded animals and recently veterinarians from outlying islands have been added. In the case of monk seals, they are so critically endangered that stranding responses are handled by Federal personnel.

In the Northwest Region, a primary response center has been designated in each of five geographical areas. They are a veterinary coalition, the Washington Department of Wildlife, and three academic institutions. The veterinary coalition includes veterinary facilities at a dozen sites. The list of private participants includes two museums and an individual affiliated with a museum, a research institution, and an individual with facilities for handling large dead whales and storing skeletal materials. Four aquaria, one zoo, and a wildlife rehabilitation center are listed as having the capacity of holding live marine mammals but do not necessarily respond to strandings themselves. Both State and Federal agencies play a major role in the Northwest Network. In particular, both the Washington Department of Wildlife and the National Marine Mammal Laboratory are principal participants and the Oregon Department of Transportation has assumed the responsibility of disposal on Oregon's beaches.

NETWORK GOALS

Implicit in the report from the 1977 stranding workshop are several goals for the Stranding Networks. Subsequent to that meeting, the agency made no effort to formalize such goals. One Network participant expressed frustration over this fact and said that NMFS needs to clearly define the goals of the Networks and communicate them to Network members. He commented that the responsibilities of participants could not be defined clearly until such goals were developed.

The lack of such goals has had two results. First, there are differences in emphasis among the regions. In some areas, the purpose of the Network is almost exclusively the generation of scientific information. In others, the rehabilitation of stranded animals has a higher priority. Second, without specific goals, it is not possible to evaluate the performance of the Networks or their members.

None of the stranding directories contains more than a general statement of purposes. In an attempt to address this shortcoming, Dr. Robert Hofman proposed four general goals in a paper presented to the 1987 stranding conference. These are:

> "1. to minimize the possible threats of beached and stranded marine mammals to human health and safety;
> 2. to minimize the pain and suffering of live-stranded animals;
> 3. to derive maximum possible scientific and educational benefits from both live- and dead-stranded marine mammals; and
> 4. to establish long time series of data necessary to determine natural variation and detect changes in mortality levels and patterns, contaminant loads, and other variables that may be indicators of the status of coastal marine mammal populations and the ecosystems of which they are a part" (Hofman in Reynolds and Odell, in press).

The first two of these goals closely track provisions in Section 109(h)(1) of the MMPA. As is discussed below, § 109(h)(1) has been used as the legal framework to establish the Networks. The latter two goals are consistent with the general purposes of the MMPA and are clearly within the range of the recommendations made by the 1977 stranding workshop. In each of the Networks, a major portion of the responses to stranding events are carried out by individuals who have a scientific interest in marine mammals. To the extent that there are explicitly stated justifications for the Networks, each has emphasized that stranded animals are a valuable resource for scientific data.

The California Marine Mammal Stranding Network developed a similar set of goals. They include:

> "1. To establish a mechanism ensuring that a legal, coordinated, and appropriate response is made to stranding events.
> 2. To coordinate mechanisms for treatment of live stranded animals and to monitor their ultimate disposition.
> 3. To collect basic scientific information from stranded animals.
> 4. To analyze these data and to use them to monitor the frequency of stranding events.
> 5. To disseminate this information for scientific and public purposes so that marine mammal populations may be better understood and managed" (Seagars and Jozwiak in Reynolds and Odell, in press).

Although similar to the goals proposed by Dr. Hofman, there is a subtle shift in focus. Much of the emphasis is on agency responsibilities.

Either set of goals are good general statements of the Networks' purposes. They do not have sufficient specificity, however, to serve as the basis for evaluation. Although the Networks' success is tied to the efforts of volunteers, minimum standards are necessary if the data generated are to be useful. Even the most basic information relating to species and numbers of animals stranding may be influenced if an individual is unreliable in responding to stranding events. Further, those who use the basic information provided by the stranding report forms should have a degree of confidence that the reports are accurate. One network coordinator pointed out that the structures of the Networks differ enough that secondary goals and explicit criteria may have to be tailored to each Region (Pers. comm. T. McKenzie, 1989). Certainly the goals should be general enough that they may be adapted to the regions; however, the inclusion of general performance goals will provide a framework from which evaluations can be made without being arbitrary.

RECOMMENDATIONS

1. A policy statement should be drafted which includes a listing of network goals. Such goals should be included in stranding directories and serve as the basis for establishing performance criteria in each of the Networks.

2. Suggested goals--Because § 109(h)(1) of the MMPA serves as the legal authority for the Networks, it would be useful to follow Dr. Hofman's example and adapt the statutory language with slight alterations to his language:

> to minimize the possible threats of beached and stranded animals to public health, safety, and welfare;

As is pointed out below, there is a potential for the transmission of disease from stranded marine mammals to domestic animals. San Miguel Sea Lion Virus is indistinguishable from Vesicular Exanthema of Swine Virus (Smith et al., 1974). The possibility that the disease could be introduced to domestic swine has caused considerable concern on the west coast. On the east coast, both harbor seals and pilot whales have been infected with influenza viruses closely related to avian influenza viruses (Hinshaw et al., 1984 and Hinshaw et al., 1986). Limiting the goal to human health is, therefore, unduly restrictive. The addition of "safety," though, does address an issue which is perhaps beyond the scope of the statutory definition, i.e., the possibility that members of the general public could be injured by live stranded animals.

> to provide for the protection, welfare, and humane treatment (including, when appropriate, euthanasia) of live stranded animals;

As a subsidiary goal to this:

> to provide, when appropriate, for the rehabilitation of sick or injured marine mammals and the care of abandoned or orphaned immature animals. Once rehabilitated, such animals should either be returned to their natural habitat or serve as a substitute for capturing animals from the wild under public display permits;

A major portion of the report of the 1977 stranding conference relates to the rehabilitation of marine mammals, and it is clear that one of the perceived roles of the Networks was to be the recovery of such animals. As the Networks have evolved, rehabilitation has become

a major activity. Although there is not unanimity among the Regions that this should be a goal, it is generally accepted that it is a proper function for Network involvement.

In addition to the statutory goals, it is clear that one of the major motivations for Network participants is the opportunity to gain scientific information. To the extent that there is any stated goal common to all of the Networks, it is:

> to gain the maximum possible amount of scientific information from dead stranded marine mammals and, where consistent with other goals, from live stranded marine mammals.

Each of the Networks has involved scientists who have collected data and tissues for research. At the discretion of the Network member, they have also provided tissues to other researchers subject to the limitations imposed by the individual Region. Although it should not be a condition for Network participation, cooperation in obtaining specimen materials for other researchers should be encouraged. Just as important, however, is quality control over the specimens which are obtained. Tissues should be properly documented and preserved. Dr. John Heyning has suggested that the collection and curation of tissues from strandings be standardized (Heyning in Reynolds and Odell, in press). To successfully achieve the previous goal, maximum practical utilization of tissues from stranded animals should be a secondary goal:

> to the extent feasible, tissues from stranded marine mammals should be collected, curated in accordance with professional standards, and provided to legitimate researchers and to institutions which maintain marine mammal collections meeting curatorial and archival standards;

From the perspective of the agency, data from strandings can be used to supplement other information in fulfilling management and enforcement responsibilities. Time series data should be of sufficient quality to detect unusual developments such as epizootics and increased mortality of marine mammals in commercial fisheries. If the response rate is high and consistent and the quality of reporting is good, even the most basic data contained on stranding report forms such as species, sex, and length can be useful. More detailed information can assist in determining the status of particular marine mammal populations. The information can also be used to supplement other agency activities. As an example, traditionally, a significant portion of dead stranded pinnipeds in the Pacific northwest have been shot (Stroud and Roffe, 1979 and R. Ferrero, pers. comm., 1989). A marked increase in the numbers of dead pinnipeds that have been shot could alert the agency to a possible enforcement problem.

> to generate information which will assist in making management decisions on both marine mammals and fisheries;

Among the stated goals of the MMPA is "...to maintain the health and stability of the marine ecosystem." Recently, much attention has been drawn to the health of marine ecosystems. Concern has been raised over the level of contaminants in the marine food web. This has had dramatic expression in concern over the amount of natural and manmade contaminants being carried by marine mammals and the possible impact on the animals' health. Others have also said that because they are at the top of the trophic chain, marine mammals could be potential indicator species of environmental contamination. To date, lack of basic scientific knowledge, lack of funding and inconsistencies in the collection, curation, and testing of tissues from stranded marine mammals have limited the ability to draw meaningful conclusions. Nevertheless, it should be a goal of the Networks to gather information which will help monitor conditions in marine ecosystems:

to collect and preserve tissues, in accordance with standard protocols, which can be used to monitor the types and levels of environmental contaminants present in different species and age/sex classes of marine mammals from different geographic areas and the health of the marine ecosystems of which they are a part.

As indicated above, more specific goals are needed if Network performance is to be evaluated. The report of the 1977 stranding workshop set a goal for response rates. It said that it was the responsibility of each Network to "assure an effective mechanism for response to every stranding" (emphasis added)(Geraci and St. Aubin, 1979). Although such a goal may be overly optimistic given geographic limitations and the volunteer nature of the Networks, a maximum response rate should be included among the goals:

to achieve maximum feasible reporting of and response to stranding events;

The stranding reports contain basic minimum data which was defined as Level A data by the 1977 workshop. Level A data will be discussed in detail below and are listed in Appendix B. Such data should be accurately reported, and it is not unreasonable to expect Network members to be accurate in filing minimal data:

accurate reporting of Level A data from all stranding events;

Finally, although the agency has made very little effort to keep Network members and the public informed of knowledge gained from strandings, it is the author's opinion that the agency has a responsibility to those who make a major contribution to its efforts without remuneration. Recognizing that it is far from fruition, the final goal in the Seagars and Jozwiak paper should be added:

to disseminate information gained from marine mammal strandings for scientific and public education purposes.

LEGAL FRAMEWORK

With the passage of the Marine Mammal Protection Act (MMPA) in 1972, Public Law 92-522 (16 U.S.C. 1361 et seq.), the Congress determined that the Federal government would have a responsibility for protecting marine mammals. The law prohibited a wide range of human interactions with marine mammals and prohibited commerce in marine mammals or their parts. The law did provide for exceptions and set up a permitting procedure to allow public display and scientific research. The prohibitions were so comprehensive that they could have restricted the response to stranding events. Rescue of animals, taking animals into captivity for rehabilitation, and opportunistic utilization of tissues from dead animals for scientific purposes all could conceivably have been prohibited despite being consistent with the general motivation for the initial passage of the Act.

In Section 2 of the MMPA the Congress made a series of findings which justified the need for the legislation and defined the major goals and purposes of the Act.

"Sec. 2. The Congress finds that--

> (3) there is inadequate knowledge of the ecology and population dynamics of such marine mammals and of the factors which bear upon their ability to reproduce themselves successfully;
>
> (4) negotiations should be undertaken immediately to encourage the development of international arrangements for research on, and conservation of, all marine mammals;
>
> (5) Marine mammals and marine mammal products either--
>
> > (A) move in interstate commerce or
> >
> > (B) affect the balance of marine ecosystems in a manner which is important to other animals and animal products which move in interstate commerce, and that the protection and conservation of marine mammals is therefore necessary to insure the continuing availability of those products which move in interstate commerce; and
>
> (6) ... it is the sense of the Congress that they should be protected and encouraged to develop to the greatest extent feasible commensurate with sound policies of resource management and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem...."

Section 3 provides definitions of terms used in the MMPA. Three of the definitions are directly applicable to stranding situations. § 3(5) provides that the definition of marine mammal "...includes any part of any such marine mammal...." The inclusion of parts in the definition means that any limitation on activities affecting marine mammals is also applicable to such materials as tissues from those animals.

Section 3(2) provides:

> "The terms 'conservation' and 'management' mean the collection and application of biological information for the purposes of increasing and maintaining the number of animals within species and populations of marine mammals at their optimum sustainable population. Such terms include the entire scope of activities that

constitute a modern scientific resource program, including, but not limited to, research, census, law enforcement, and habitat acquisition and improvement. Also included within these terms, when and where appropriate, is the periodic or total protection of species or populations as well as regulated taking."

This section is significant because when put into the context of the findings, it is clear that Congress intended that scientific research was an integral part of the goals and purposes of the Act.

Section 102 of the MMPA provides that it is generally illegal to "take" a marine mammal. Section 3(12) provides, "The term 'take' means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Although it becomes somewhat awkward in a lexigraphic sense, the same prohibitions apply to parts of marine mammals. This definition was expanded upon in the regulations issued subsequent to the Act. 50 C.F.R. 216.3 contains an expanded definition of "take":

> "'Take' means to harass, hunt, capture, **collect**, or kill, or attempt to harass, hunt, capture, **collect**, or kill, any marine mammal, including, without limitation, any of the following: **The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal**; or the negligent or intentional operation of an aircraft or the doing of any other negligent or intentional acts which result in the disturbing or molesting of a marine mammal." (Emphasis added)

Several elements of the expanded definition would apply to stranding activities. First, any handling of marine mammals, even if for the benefit of the animal itself, has been interpreted to be harassing or disturbing the animal. Restraint or detention of animals is possible when rescuing cetaceans and when animals are taken into facilities for rehabilitation. The language on tagging has inhibited tagging of stranded animals in the past. Finally, by adding the word "collect" to the definition, the retention of tissues from dead stranded animals could be prohibited except in accordance with a permit issued for scientific research.

Section 102(a)(3) extends the prohibition to subsequent activities by prohibiting the possession of any marine mammal or marine mammal product taken in violation of the Act. Such language could have implications both for the curation and storage of tissues from stranded animals and for whether or not such tissues may be transferred to others who may be doing research.

During the initial passage of the Act, the Congress did not consider the disposition of beached and stranded animals. There is no reference to how such activities are to be handled in the original conference report. Nor are there any references in either the House or Senate reports. Despite this, NMFS has used two sections of the Act to deal with strandings.

Section 109(h) of the MMPA provides:

> "(1) Nothing in this title shall prevent a Federal, State, or local government official or employee or a person designated under section 112(c) from taking, in the course of his or her duties as an official, employee, or designee, a marine mammal in a humane manner (including euthanasia) if such taking is for--
>
> (A) the protection or welfare of the mammal,
>
> (B) the protection of the public health and welfare, or
> (C) the nonlethal removal of nuisance animals....

(3) In any case in which it is feasible to return to its natural habitat a marine mammal taken or imported under circumstances described in this subsection, steps to achieve that result shall be taken."

The language in this section differs significantly from the original version. The original Act was limited to State and local government employees. Although the Congress did not specifically address stranding situations, it is probably safe to assume that they were satisfied to let things operate as they had until that time, i.e., the state or local government involved had the authority to remove an animal in order to protect public health and welfare, and they could take whatever other steps they wished with animals so that if a local institution wished to take samples, they could do so with the indulgence of the authorities. As the Act is currently written, it extends the authority to Federal officials and to persons given authority under § 112(c). It is clear, however, that concurrent jurisdiction over stranding events exists between the Federal government and units of State and local governments.

There are two provisions which can be directly related to stranding situations. An official can take actions to protect an individual animal. This exception permits a "taking" action which would involve handling of an animal even if it would technically constitute harassment. Providing for an individual marine mammal's welfare could also entail placing an injured or sick animal into a rehabilitation program. Such a period of captivity is delimited by subsection (h)(3). Clearly, it is the intent that if such action takes place that the animal be restored to the wild if it is feasible. 50 C.F.R. 216.22(3) lends further clarity to this provision in the case of taking by State or local government officials. "Where the marine mammal in question is injured or sick, it shall be permissible to place it in temporary captivity until such time as it is able to be returned to its natural habitat."

Section 216.22(b) requires that a report be filed covering any such takings by State or local government officials.

"Each taking permitted under this section shall be included in a written report submitted to the Secretary every six months beginning December 31, 1973. Unless otherwise permitted by the Secretary, the report shall contain a description of:

(1) The animal involved;

(2) The circumstances requiring the taking;

(3) The method of taking;

(4) The name and official position of the State official or employee involved;

(5) The disposition of the animal, including in cases where the animal has been retained in captivity, a description of the place and means of confinement and the measures taken for its maintenance and care; and

(6) Such other information as the Secretary may require."

Because of the change in the nature of responses to stranding events and because the regulations were not updated after the 1981 changes in the Act, an anomalous situation has been created. Clearly, stranding situations were intended to be covered by this section. As written, however, the regulation only applies to State and local government employees. Currently the Stranding Networks are composed primarily of private volunteers operating with Letters of Authority granted under Section 112(c) of the MMPA.

The reports required under 50 C.F.R. 216.22(b) have become an anachronism. Two of the Regions were unaware of the requirement, and almost no reports have been filed under this provision. In essence, the stranding report forms required of Network members fulfill this function in terms of actions on site. The requirement breaks down, however, in terms of reporting the disposition of animals undergoing rehabilitation. As will be pointed out below, reporting on such animals has been informal, or even lax, in some places, and the agency has not followed through on its responsibility to monitor the improvement of such animals and see that they are returned to the wild if feasible.

It is strongly recommended that 50 C.F.R. 216.22 be revised to reflect the changes which occurred in the law after the initial regulations were promulgated and the structural changes which have occurred in response to stranding events. At a minimum, current language should be expanded to include persons designated under 112(c). There are several language changes and suggestions for reporting which will be covered in more detail below.

As has been alluded to above, the current Stranding Networks (with one exception) use Section 112(c) of the Act in conjunction with Section 109(h) to authorize Network members to respond. The language in § 112(c) reads:

> "The Secretary may enter into such contracts, leases, cooperative agreements, or other transactions as may be necessary to carry out the purposes of this title and on such terms as he deems appropriate with any Federal or State agency, public or private institution, or other person."

The majority of Network members have had Letters of Authorization issued to them under this provision.

There is a provision in the regulations which relates to the retention of hard parts from dead marine mammals. 50 C.F.R. 216.26 provides:

> "§ 216.26 Collection of certain marine mammal parts.
>
> (a) Any bones, teeth or ivory of any dead marine mammal may be collected from a beach or from land within ¼ of a mile of the ocean. The term "ocean" includes bays and estuaries.
>
> (b) Marine mammal parts so collected may be retained if registered within 30 days with an agent of the National Marine Fisheries Service, or an agent of the Bureau of Sport Fisheries and Wildlife.
>
> (c) Registration shall include (1) the name of the owner, (2) a description of the article to be registered and (3) the date and location of collection.
>
> (d) Title to any marine mammal parts collected under this section is not transferable unless consented to, in writing, by the Secretary."

The registration provision is particularly important if the agency is to fulfill its enforcement responsibilities. Without knowing whether or not a marine mammal part is legally in the possession of an individual, enforcement of the prohibition on commerce and the provision in 50 C.F.R. 216.13(b) prohibiting the possession of any marine mammal or marine mammal part taken in violation of the Act could become problematic.

There is little consistency in the application of the registration requirement between the Regions. In the Northeast, no effort has been made to make sure that hard parts are registered and some of the Network members said that they were unaware of such a requirement. In the Southeast, a similar situation prevails. Although it is acknowledged

that the provision applies to Stranding Network members, almost no registrations have been received. Over a 4-year period, only seven registrations have been made, and those registrations are, for the most part, beachcombers who have recovered things such as marine mammal skulls. In both the Southwest and the Northwest, the stranding report form is structured so that retention of tissues is reported. The form in the Northwest is divided so that the lower half of the form serves as a registration.

If enforcement of the Act is to be adequate, it is essential that any parts of marine mammals have some sort of documentation. That documentation should be traceable back to the original take. It should be emphasized that there is no evidence that any of the members of the Stranding Networks have abused their authority to take tissues or that tissues have entered into commerce via the Stranding Networks. Those who have collected tissues have done so for legitimate scientific purposes, and they have been conscientious in seeing that tissues do not find their way into commercial channels.

In a paper presented to the Stranding conference held in Miami in 1987, Gene Martin, Jr., Attorney-Advisor in the Office of General Counsel of NOAA, laid out some of the legal background for collection of tissues from stranded animals. He states that the authority for collection of tissues is covered under 109(h) of the MMPA and is, therefore, subsidiary to the explicitly stated purposes of protecting the public health and welfare and the protection or welfare of the mammal. He states, "(I)t bears emphasis that collection of specimens and data from marine mammals is a secondary objective to a beached/stranded event and that the underlying authority to collect such specimens and data without a permit stems from the need to protect the immediate welfare of the animal or public, not from the scientific need for more data" (Martin in Reynolds and Odell, in press).

While those concerns should be paramount in any stranding event, certainly § 112(c) provides authority in and of itself for the Secretary to enter into agreements to carry out the purposes of the Act. As pointed out above, one of the major purposes of the Act is to produce and apply biological information which could be applied to management decisions. At one point Martin emphasizes the consistency of such data collection with the general purposes of the Act. "NMFS considers such collection activities as necessary to the overall understanding of beached/stranded marine mammals and ways to enhance their rehabilitation and survival which promotes important policy objectives of the MMPA. Moreover, NMFS recognizes that collection of data and specimens from beached/stranded animals reduces the need to collect from other animals in the wild and thus serves an important conservation function" (Martin in Reynolds and Odell, in press). It should be pointed out that § 112(c) can stand independently and is not dependent on § 109(h).

Although seemingly insignificant, the difference in emphasis could affect the goals of the Networks. A large number of the Network participants are primarily involved in order to gain scientific data from stranded animals. The information generated has been used in making management decisions. From an agency perspective, one of the primary justifications for the operation of the Stranding Networks are the contributions which they can make to the body of knowledge on marine mammals.

There are some other legal issues pertaining to the use of tissues which need to be clarified. As pointed out above, 50 C.F.R. 216.26 applies only to hard parts. Some clarification as to the status of soft tissues is necessary. Under what circumstances can an individual possess soft tissues from stranded animals? There is ample reason to allow the collection of such tissues but current regulations are silent as to the conditions under which they can be taken. Since the definition of "take" includes collection of parts from marine mammals, without some sort of exception the collection of soft tissues may be of questionable legality.

The issue of transfer of collected tissues also needs to be addressed. Several Network members stated that they were uncertain as to whom tissues taken at a stranding event could be transferred. In some areas, the transfer is treated in an almost cavalier fashion leaving it to the discretion of the Network member as to whether or not they may transfer tissues to another researcher or an educational institution without a requirement that the agency be notified. At the opposite extreme, in other areas, transfer of ownership is prohibited and only a long-term loan may be made with the provision that such a loan must be approved by the Regional office. The agency has provided implicit approval of the transfer of tissues by directing applicants for scientific research permits who wish to obtain tissues from stranded animals to make requests to the Stranding Networks. Rather than processing the application, the researcher is given the addresses of the Stranding Network coordinators and informed that a permit is not necessary.

Some additional clarification is also needed for the disposition of tissues from marine mammals which are also listed under the Endangered Species Act (ESA). It may be more important to obtain tissues from dead stranded endangered species than from other marine mammals. Important information on genetics, life histories, and other factors affecting recovery can be gained from stranded animals. Both the Draft National Recovery Plan for the Humpback Whale and an initial draft of a similar recovery plan for the right whale make recommendations for the use of tissues from stranded animals in order to both meet specific information needs and monitor various anthropogenic and natural impacts on the populations.

In many ways the provisions of the MMPA and the ESA are parallel. The ESA, however, does not contain a provision similar to Section 112(c) of the MMPA which gives the Secretary general authority to enter into agreements in order to fulfill the general purposes of the Act.

To date, the agency has treated the handling of such tissues in a pragmatic fashion. Certainly it is better that the tissues be used to contribute to our base of information on the species than to have the animal buried in a landfill. The agency has allowed the utilization of tissues from endangered species in the same manner as tissues from other marine mammals are utilized.

Finally, there is some question of the relationship between scientific research permits and activities of the Network. As pointed out above, for tissues the policy has been that no permit is necessary, but an individual can obtain tissues at the discretion of the Networks. Section 101(a)(4) of the MMPA provides for the issuance of permits for scientific research. It should be recognized, however, that a large portion of the research being conducted on marine mammals does not take place under permits. Because of the nature of strandings, there is a reason why a separate process is appropriate. Strandings are an opportunistic occurrence, and one cannot predict what species, the numbers, or how tissues might be utilized with any degree of certainty. Further, the first call on the use of such tissues should be reserved to those who are willing and able to do the work. A permit should not have primacy over the utilization of tissues from stranding situations.

Providing documentation on tissues can actually be a protective mechanism. NMFS has a responsibility to enforce the prohibitions on illegal possession of marine mammal parts. It is an impossible task if a major portion of the extant inventory of such parts has no documentation. The author also sees little reason for requiring the occasional beachcomber who comes across a tooth or bone to register such items if we cannot account for the majority of bones or teeth from the same area.

It is recommended that each of the Networks inform all of their members that it is mandatory that hard parts be registered and that 50 C.F.R. 216.26 makes no exception for those who participate in Networks. If 50 C.F.R. 216.22(b) is rewritten as suggested above, it

is recommended that the provisions applicable to the disposition of tissues from stranded animals be incorporated there rather than in a section which seems to be designed for beachcombers.

The regulations should also be rewritten so that they apply to soft tissues. It is not the intent that each sample be separately registered. It would be sufficient to list "carcass" if an entire animal is taken in. Subsequently, all specimens from the animal should carry the same unique number. It should be noted that assigning such a number is consistent with proper curation methodology. Such a change could be made as a revision of 50 C.F.R. 216.26. If there is a reason, however, to separate registration requirements for scientific specimens from those picked up by the casual general public in order that the general public not be allowed to take soft tissues, new language could be added in the reporting requirements at 50 C.F.R. 216.22(b) after that provision has been revised to accurately reflect the stranding Networks.

Additionally, a requirement should be added that the agency consent to any transfer of title to parts. Again, this serves as documentation that an individual is legally authorized to possess marine mammal parts. Having admonished those who work so hard to collect such tissues, an admonition is in order to the bureaucrats. Often tissues are transferred to other researchers or collections. It should not be the role of the agency to pass judgment on the details of any research project. It is sufficient to receive assurances from the recipient that the tissues will be used for legitimate purposes. Among legitimate purposes should be curated collections, scientific research, and educational programs. The recipient should be notified that the unique registration number is to be retained so that it can be traced back, the tissue may not enter into commerce, and any subsequent transfer must receive the consent of the agency.

Finally, it is recommended that action be taken to clarify the disposition of parts from endangered species. There are a couple of options for such action. First, NMFS could issue itself a scientific research permit for the taking of parts from dead stranded animals which are listed under the ESA. Because of the difficulty in providing specifics as to the number of animals and the specific research to be performed, such permits might stretch the definition of acceptable scientific research.

The second option would be to make a regulatory change permitting Federal or State employees or other authorized persons to take parts from dead stranded animals for scientific purposes. The Fish and Wildlife Service has a similar exception for species under their authority. 50 C.F.R. 17.21(c)(3)(iii) permits the salvage of dead specimens for scientific study. A similar provision for those species under the authority of NMFS would clarify the disposition of parts from stranded endangered species and would have the advantage of consistency with Fish and Wildlife provisions under the ESA.

EVOLUTION OF CURRENT POLICY

Soon after the enactment of the MMPA, it became apparent that the Act had unanticipated consequences in terms of how to deal with stranded animals. Although not technically a stranding situation, in January, 1973, the Federal government became the ward of five bottlenose dolphins which had apparently been abandoned by their owner. In March, a female killer whale stranded on a beach in the State of Washington and was taken to the Seattle Marine Aquarium. The question of the legal status of the animals and the proper disposition of live stranded animals became the subject of a regulatory hearing on May 22, 1973, in Washington, D.C.

Although the primary focus of the hearing was the disposition of live stranded animals, the issue of access to tissues from dead marine mammals was raised. The hearings file contains letters from Dr. Kenneth Norris and Dr. James Mead in which the importance of tissues for scientific research was emphasized. Dr. Norris suggested that the Federal government designate depositories for collection and preparation of marine mammal materials with ultimate disposition of the material at the Smithsonian Institution.

The hearings examiner made a recommendation dealing with the disposition of tissues. He wrote:

> "It is essential that full scientific value be obtained from each dead animal. This may require depositories to which all or significant parts of the animal will be brought. Dead animals or parts thereof should, as a matter of policy, be given (to) non-profit scientific research or educational institutions as a first priority. I would place in this category, public museums that may wish to stuff an animal for public display. Absent a demand by these non-profit institutions, the animal or parts thereof should be disposed of in any manner that will result in some use (emphasis in original) before considering burying, incineration or other destruction. While a list of priorities could be established, it may be more prudent to simply leave the disposition with local authorities where they have assumed this role." (Memorandum from Steven E. Schanes to Robert W. Schoning dated August 13, 1973. See Appendix C).

Despite the implication that use of such material should be as uninhibited as possible, the operative policy of NMFS was much more restrictive. Until 1977, a scientific research permit was required to work with materials from stranded marine mammals.

The vast majority of comments during the 1973 hearing, however, dealt with the disposition of live stranded animals. In anticipation of the hearing, the International Association for Aquatic Animal Medicine developed a suggested protocol for stranding situations during their April 30-May 2, 1973, annual meeting. Their suggestions served as precursors to some of the issues which would develop in the hearing. Section V of the protocol dealt with rehabilitation. It stated, "If recovery is satisfactory, an animal should be returned to its natural habitat." In an attached memorandum, it was suggested that the determination as to recovery should be left to the attending veterinarian. If it was determined that the marine mammal could not be returned to the wild, it would be "adopted" by the institution which had provided the care. The protocol then anticipated what would become a troublesome issue, i.e., whether such animals should be counted against permit quotas. It reasoned, "Probably no stranded animal is equal to an animal obtained by permit and wild capture; therefore, animals obtained by rescue should not count against quotas or utilization rates."

Dr. Steven Schanes chaired the hearing and listed the alternative to be considered:

"1. Returning healthy mammals to nature;
2. Donating, auctioning, or selling such mammals to zoos and oceanaria;
3. Humanely dispatching sick or injured animals which obviously could not survive; or
4. Allocating such animals to holders of permits or exemptions for undue economic hardship."

Very early in the hearing he raised a concern that the use of stranded animals might end up as a means of getting around permitting requirements.

Representatives of the display community, with the exception of the IAAAM, generally advocated that a rescued animal become the permanent charge of the facility which nursed it back to health and that the facility be free to dispose of the animal at their discretion including the sale of the animal at a fair market price. A couple of people expressed concern that the cost of rehabilitating animals would be prohibitive if they could not retain them for display. It was also recommended that such animals not be counted against any quotas for public display permits. The representative of Sea World said that such animals should be entered into the Marine Mammal Inventory, but there should be a separate category for beached and stranded animals.

Representatives of the environmental community urged that every effort possible be made to restore such animals to their natural habitat. Karen Sheldon, representing the American Littoral Society stated, "The burden should be to show why an animal cannot be returned to the wild, and we should stress returning the animal and rehabilitating him so he will be able to function in his natural environment." She advocated the return of the animals even if it necessitated retraining of the animal. The environmentalists expressed the opinion that if an animal could not be returned to the wild, it should be sold with first priority being given to the rehabilitation facility and counted against any permit in lieu of a taking from the wild.

At the time, the issue of returning marine mammals to the wild may actually have been moot because the state of the science was such that only a small number of pinnipeds and virtually no cetaceans survived. Frank Powell of Sea World pointed out that in nine years of efforts to rehabilitate mainly pinnipeds, the mortality rate was close to 80 percent. The conventional wisdom held that even animals which had recovered would have difficulty readapting to the wild. Dr. Robert Temple of the International Association for Aquatic Animal Medicine pointed out that such animals would be slower and not accustomed to catching prey. In the case of very young animals, they would have no experience in catching prey and would have no fear of predators. Finally, behavior of animals could be so altered that a dependence syndrome would have developed and even a healthy animal would not be fit for reintroduction to the wild. In written comments, Marineland of the Pacific pointed out that their policy was to return only animals which had received external wounds because other kinds of medical problems, such as diseases and parasites, tended to debilitate animals to the point where an animal would no longer be competitive in its natural environment.

Both the American Association of Zoological Parks and Aquariums and the representative of the New York Zoological Society suggested that NMFS designate specific institutions as Marine Mammal Rescue Centers. Such institutions would be responsible for the care of stranded animals, and a Marine Mammal Conservation Advisory Committee would be responsible for establishing standards and guidelines including the disposition of individual animals.

Dr. Schanes' recommendations (see Appendix C) were that the Federal role in stranding operations be limited and that State and local governments continue to have primary responsibility. He envisioned Federal approval of State stranding plans including the setting of basic standards for Marine Mammal Rescue Centers which would be under the authority of the States. The Federal responsibility would include establishing a system for the national collection of data and a program to develop "research programs concerning the care of marine mammals and all aspects of returning them to the wild." The recommendations also presaged policy on rehabilitated animals by advocating that such animals be used to satisfy permits.

After the hearings, the NOAA Office of General Counsel suggested some possible amendments to the MMPA in a memorandum dated September 6, 1973. The intention was to clarify authority over strandings and the subsequent disposition of marine mammals. The memorandum to Dr. Robert F. Hutton stated, "The Office of General Counsel is of the opinion that the omissions of the Marine Mammal Protection Act with regard to this subject are so extensive that new legislation amending the Act is necessary." The memorandum laid out two options.

The first option would have added a new subsection dealing specifically with the taking of beached, stranded, injured, ill, or dead marine mammals. It would have expanded the authority to rescue animals to explicitly include Federal officials. In addition, the Secretary would certify Marine Mammal Rescue Centers. Additionally, the final disposition of any animal which could not be returned to its natural habitat would be determined by the Federal government. It was recognized that such an amendment would entail the issuance of regulations dealing with the utilization of tissues from dead marine mammals.

The second option would have given total authority to the States to deal with stranding events and the subsequent disposition of rescued marine Mammals or parts from dead animals.

As other issues became more important, the question of whether to amend the Act or issue regulations concerning the disposition of animals and tissues was not addressed. The agency seems to have been content with allowing stranding operations to continue as they had up until the passage of the Act. In November 1973, NMFS notified each of the coastal States of their authority to respond to stranding events and of the section of the interim regulations which would eventually become 50 C.F.R. 216.22. The issues of rehabilitated animals and scientific research remained unaddressed. Although there seems to have been no explicit policy statement, NMFS did require research permits for those who wished to utilize tissues from stranded animals for scientific research.

On August 29, 1973, NMFS first utilized a Letter of Agreement with a facility for permanent retention of a stranded marine mammal for which a determination had been made that the animal could not be returned to the wild. The killer whale which had been one of the reasons for the hearing was transferred to Sea World. The animal was not counted against permitted takes. Since that time, the Letter of Agreement has been the most common means for permanent accession of stranded animals although there was no formal policy until 1977.

The possibility of using rehabilitated animals as a substitute for taking from the wild for public display permits continued to be discussed as an option. Furthermore, as methods of care became more sophisticated, the pool of available rehabilitated animals became larger. In a memorandum dated January 7, 1975, to the NMFS Marine Mammal Coordinator, the NOAA General Counsel's office opined that such an option was consistent with the purposes of the MMPA. The memorandum also discussed the possibility of reimbursement to those who had nursed an animal back to health by the permit holder, but it was decided

that authority to order such payments did not exist. Finally, the memorandum expressed a clear preference for the use of rehabilitated animals over a take from the wild. It stated:

> "We do not believe it sound policy to draft a permit that would allow a permittee a choice either to obtain a beached and stranded mammal from a private facility or to take a mammal from the wild,--unless there are compelling circumstances. The view that we should 'use up,' where possible, beached and stranded mammals before taking from the wild is excellent and should not be undercut. An applicant perhaps should be required to state why a beached and stranded mammal will not satisfy his or her needs before authorization is given to take from the wild."

It should be noted that although the references are to marine mammals generally, in reality the discussion was focused on the utilization of stranded pinnipeds. Although it became policy to encourage the utilization of beached/stranded animals, an applicant was not instructed to substitute rehabilitated animals for a take from the wild. It led to almost surrealistic situations. Peter Howorth, who was both a collector and involved in the rehabilitation of pinnipeds, related one of these situations in a letter to the Director of NMFS dated May 24, 1977. He simultaneously was releasing rehabilitated California sea lions and capturing others for a public display permit:

> "The permit called for one male and four female California sea lions. Prior to the trip, I had rehabilitated one male and two female sea lions.... These three rehabilitated animals we took along on the trip and released after duly notifying appropriate agencies and filing the necessary reports. One animal tried repeatedly to climb back aboard.
>
> According to regulations and policies, (a NMFS official) informed us that if we had recaptured our rehabilitated animals, we would be allowed to keep them for (the public display permit)....
>
> To me it is absurd that we can rehabilitate an animal to a standard acceptable to permit holders, then take them out to the islands, release them, and capture a few wild animals in their place. Either that or open up their cages so they will fall into our nets."

Continuing uncertainty over the disposition of rehabilitated animals and the frustrations of the people responding to stranding events led to several changes in policy in 1977.

On July 5, 1977, a memorandum was sent to NMFS Regional Directors by Winfred H. Meibohm, Associate Director of the National Marine Fisheries Service, entitled "Disposition of Living, Stranded Marine Mammals" (See Appendix D). Since this memorandum is commonly cited as both the authority for the Stranding Networks and a general statement of policy, it is worth examining in some detail.

The memorandum provided that a live stranded marine mammal could be humanely euthanized upon the recommendation of competent State, local, or Federal officials if done under veterinary supervision. It did not give any guidance, however, as to what was humane or how a determination was to be made.

It allowed a live stranded animal to be taken into captivity for the purposes of rehabilitation by:

> "a. State or local government employees or officials;
> b. Federal agents;
> c. the Holders of valid Federal permits issued for this purpose; or
> d. any Party to an agreement with NMFS, which is entered into for this purpose."

Particularly significant was the inclusion of the fourth category. It was a movement away from the existing policy of leaving responsibility for overseeing respondents to State and local governments. It anticipated the use of § 112(c) of the MMPA to allow people to respond to stranding events. This provision of the policy has been cited as the justification for the issuance of Letters of Authorization for Stranding Network participation. It should be recognized, however, that the original statement was limited in application to what had become a nettlesome issue--the disposition of living stranded marine mammals.

Assuming successful rehabilitation, the memorandum provided that a determination should be made "on the basis of the best available medical advice" regarding the desirability of returning animals to the wild. Although it did not define the procedure for such a determination, it was clearly the intent that at some point such a determination should be made and that animals should not be perpetually maintained in an indeterminate status. Those animals returned to the wild were to be released in the vicinity of other marine mammals of the same species.

For animals which could not be returned to the wild, the memorandum provided two options. At the discretion of the NMFS Regional Director, who would make a determination that the receiving facility could properly care for the animal, the animal could either be:

> "Placed into the permanent custody of the Holder of a valid Permit, to be used in lieu of taking an animal as authorized by the Permit; or
> Placed into the permanent custody of any competent facility."

Procedurally, the Regional Director was given three methods to accomplish the transfer:

> 1. It could be charged against a permit in lieu of a take from the wild;
> 2. A facility which had a permit for the same or other species of marine mammals could be authorized to obtain the rehabilitated animal, but it would not be counted against the permit. Conditions for the care of permitted animals would apply to the newly acquired animal; or
> 3. The Regional Director could "(e)nter into an Agreement for the permanent care of the animal, with a non-permit-holding facility, the conditions being similar to permit conditions."

The last two procedures utilized the Letter of Agreement process which had been in place since the placement of the killer whale in 1973. Although the recommendations did include the possibility of being charged against a permit, with the exception of foreign facilities the modus operandi became the Letter of Agreement. In the case of foreign facilities, it was recognized that assurances that a facility met care and maintenance standards were more difficult to confirm. Furthermore, once a marine mammal has left the country, exercising control over its care becomes problematic. Permits for rehabilitated animals continue to be required from foreign facilities.

The Letter of Agreement process became the preferred option for placement of animals because it was a much quicker and less burdensome means of matching facilities that wanted marine mammals with facilities that had rehabilitated animals available. It was pointed out that the retention of rehabilitated animals would continue to be a financial drain on facilities that had already voluntarily spent their own resources to help stranded animals recover. In order to decrease the possibility of such facilities becoming overcrowded and to limit their expenses, it was determined that a process which was more expeditious than the permitting process was necessary. Soon after the Meibohm memorandum, the Permits Division actually stopped processing domestic permit applications for pinnipeds unless there was convincing evidence that a rehabilitated animal

could not meet the needs of the applicant. Applicants were instructed to contact the appropriate NMFS Regional Office concerning the availability of such animals. With a couple of minor exceptions, after 1977 no permits were issued for the taking of pinnipeds from the wild. This became written policy when the permit application instructions were prepared in October, 1981. They state:

> "NMFS encourages the use of healthy beached/stranded animals in place of taking animals from the wild. In the case of U.S. coastal pinnipeds, such as California sea lions, applicants are required to justify the need for taking animals from the wild rather than obtaining rehabilitated beached/stranded ones. For information on the availability of these animals, contact the appropriate NMFS Regional Office. U.S. facilities may obtain beached/stranded animals under a Letter of Agreement with the Regional Director and do not need a permit."

Item IV F of the instructions further provides that an applicant must provide, "The reason for removing a live animal from the wild rather than using a beached/stranded one."

Actually, a number of pinnipeds which probably could have been restored to their natural habitat went into permanent captivity. Nothing more than a certification that the animal could not be reintroduced to the wild was required, and in many cases supporting veterinary documentation was entirely lacking. It was a pragmatic way of solving a problem. It was an unstated agency position that the utilization of even a healthy rehabilitated animal was preferable to a take from wild populations. The stated justification often was that such animals had developed a dependence on humans and reintroduction to the wild would be inappropriate.

Although the Meibohm memorandum has been generally accepted as the policy statement for the Networks, it should be recognized that it was limited in scope and was issued before the Networks themselves were set up. It did anticipate wider utilization of both Letters of Authorization and Letters of Agreement. It did not, however, address any questions in terms of the structure of the Network or how authority was to be divided. It also did not address the very basic problems of who can respond to strandings, how they should go about it, and the disposition of tissues from dead stranded animals.

Just as the disposition of live stranded animals was a major concern for the public display community, the disposition of tissues from dead stranded animals was a major concern of the scientific community. The frustration of scientists over the relative inaccessibility of tissues produced two actions in 1977. As one scientist put it, the requirement for a permit to obtain tissues from stranded animals was burdensome and opportunities were missed (Odell, pers. comm., 1989). At least in part because of the expressions of frustration and because of an underlying belief that there should be maximum utilization of tissues from dead stranded animals, it was decided not to require a research permit in order to work with tissues from strandings. Because strandings are inherently unpredictable, as is the research which may result from the opportunistic availability of tissues, the structure of the permitting process may have been inappropriate. Despite having been policy for several years that a permit would be required, this change was not accompanied by any formal documentation.

The second action precipitated by such concerns was the convening of a Stranding Workshop sponsored by the Marine Mammal Commission in Athens, Georgia, from August 10 through August 12, 1977. The conference dealt with a wide range of topics related to strandings and made a series of recommendations--some of which were implemented, some of which were not.

The key recommendation was that a series of Marine Mammal Stranding Networks be set up which would correspond to the NMFS regional designations. It defined membership in

the Networks as consisting of "representatives from the National Marine Fisheries Service, Fish and Wildlife Service or other law enforcement agencies, state and local fisheries officers with expressed interests, scientists, and representatives of institutions for live exhibit" (Geraci and St. Aubin, 1979). It recommended that each Network "select an individual or office to coordinate activities within the region." It did not, however, make a recommendation as to who should undertake this task or how the Networks should be administered.

It was assumed that some funding would have to be available if operations were to be effective:

> "It is recognized that the contribution of individuals and institutions involved in the network will be largely one of interest rather than financial encouragement; nevertheless, the availability of funds will ultimately determine the quality and effectiveness of the program. Though it is unlikely that funds can or should be made available to support all aspects of a national stranding program, funding must be appropriated for Basic Minimum Data collection (Geraci and St. Aubin, 1979).

The workshop recommended that a small national office be established to facilitate communication among the Networks, maintain basic data and report to participants, and refer requests for specimens, material, and data to the appropriate regional coordinator. The central office would have a narrowly circumscribed role. Any protocols on care, salvage, transportation, etc., would be prepared by the individual regions.

Much of the workshop focused on the scientific information which could be obtained from stranded animals. It strongly recommended that data collection be maximized and recommended a standard form for basic data collection. They established a standard set of data levels for information to be obtained from strandings. In order of increasing complexity Level A data would be a minimum catalogue of the event and the disposition of parts, Level B data would contain supplementary life history data, and Level C data would correspond to a complete necropsy (See Appendix B). Although standards were set for Levels B and C, the only data submitted to officials would be Level A because of the proprietary interests of the investigators.

The workshop also addressed the rehabilitation of live stranded animals. It stated that a list of rehabilitation facilities should be prepared by each region. It recommended that rehabilitated strandlings be used to fulfill permit requests in lieu of taking animals from the wild. In order to encourage this process, it was suggested that the permit application process for the transfer of such animals be simplified. The report stated that "animals should be drawn preferentially from these pools to supply permit needs, unless there are strong indications otherwise." In terms of the preferential utilization of rehabilitated animals, the report was consistent with the direction of NMFS policy development.

Finally, the workshop urged that any animals which were restored to the wild, whether on site or after being rehabilitated be tagged. This has been the policy in the case of rehabilitated marine mammals, but some ambiguity continues to exist in the case of on-site rescue because the definition of "take" in 50 C.F.R. 216.3 includes tagging of an animal.

Despite the conclusion that regional Stranding Networks should be set up, it was not really until the period 1981-83 that the Networks were formalized. With encouragement from the Marine Mammal Commission, each of the NMFS Regions took steps to set up Networks. For the most part, the Networks adapted existing mechanisms in setting up the structure. The same institutions and scientists who had previously been involved with strandings formed the core of the Networks. A change in § 109(h) during the reauthorization of the MMPA in 1981 provided the legal underpinning for the method which was used. An amendment was added which extended existing authority to "a person designated under section 112(c)."

With the exception of the Northwest Network, Letters of Authorization were issued under this provision designating members of the Stranding Networks.

In 1987, there was a second workshop on strandings in Miami. It provided the opportunity to assess the operation of the Stranding Networks and served as a forum for sharing information.

The issue of how to deal with rehabilitated marine mammals remained troublesome, and three changes were made in 1988 affecting the process by which such animals went into permanent captivity. In January 1988, the authority to issue Letters of Agreement was removed from the regions and centralized. At least in part because of public reaction to the disposition of one formerly stranded bottlenose dolphin, two other procedural changes were made. First, it was decided that if a facility had not previously received a marine mammal permit, it would have to go through an initial permit process in order to receive rehabilitated animals. Permit holders would be able to continue utilizing Letters of Agreement. This was not a new idea. On December 6, 1984, the Southwest Regional Director put forth such a concept in a letter to the Director of the Office of Protected Species and Habitat Conservation:

> "...these procedures should be modified henceforth to require nonpermitted facilities to acquire a permit for public display.
>
> Current NMFS regulations require applications for permits authorizing a "take" for public display to go through a 30-day public and Marine Mammal Commission review process. There is no such provision for comment in the Letter of Agreement process. We have had several complaints from the public regarding care of animals located in non-marina aquaria facilities. Changing the procedure would provide for a one time public review of an application for a permit submitted by a new facility.... Once a facility obtained a public display permit, the Letter of Agreement process could be used to authorize placement of additional stranded animals."

The second procedural change was to require a permit for the permanent placement of any rehabilitated cetaceans. Although inconsistent with how rehabilitated pinnipeds are handled, there are several reasons why such a policy may be justified. First and foremost, the general public seems to exhibit a greater sensitivity to the handling of cetaceans; therefore, providing the opportunity for public comment may be warranted. Second, the relative numbers of animals involved differ markedly. Rehabilitated pinnipeds are in surplus, and the difficulty lies in finding <u>any</u> facility which will accept them. There are very few rehabilitated cetaceans available. Finally, the period required for a cetacean to recover is usually longer than the recovery period for pinnipeds.

When this author was in graduate school, one of the standard required readings in public administration was a journal article entitled "The Science of 'Muddling Through.'" The author of the piece did not intend for the term to be a pejorative. He pointed out that agencies often respond to problems on an <u>ad hoc</u> basis, and policy could actually be the cumulative result of a number of <u>ad hoc</u> decisions. The "science" lies in being able to respond logically in a timely fashion with a maximum degree of flexibility and creativity.

In many ways the evolution of NMFS policy on strandings has been a case of "muddling through". The agency has been able to respond to issues as they have arisen. There is, however, no comprehensive statement of policy. That does not mean, though, that such a statement is not warranted now that a series of pragmatic decisions have shaped the structure of the Networks. It would enable those who are most affected to have a degree of certainty as to the agency's response to specific events. Developing such a statement would also serve as a mechanism for assessing individual decisions in the context of an integrated structure and a means of codifying agency positions in a systematic manner.

PUBLIC HEALTH AND WELFARE

As is indicated above, one of the provisions in the section of the MMPA which provides statutory authority for the Stranding Networks states that a "take" can occur for "the protection of public health and welfare." There are a number of ways in which stranded animals could possibly affect the health of the general public or those who handle them in the course of responding to a stranding event. Although the number of reported instances of injury or zoonoses contracted from marine mammals is small, both State and local officials and those operating the Networks should be cognizant of the possibility. Potential opportunities for exposure to injury or disease range from the initial response to a stranding to working with tissues from dead animals.

The general public is likely to be exposed to risk only at the site of a stranding. Unlike Stranding Network members, they may not be aware of potential hazards. The possibility of being physically injured by live animals or picking up pathogens common to virtually any decaying carcass creates pressure for local authorities to dispose of animals quickly. In addition, many beaches are important to the tourist trade along the coast, and an unsightly and fetid carcass may generate pressures from local businesses and authorities. Although it probably stretches the definition of "public welfare" to include possible impact on local economies, respondents should be aware of such concerns and make every effort to be prompt in responding to reports. The author encountered a number of instances when animals were disposed of before the Networks could respond because local officials were under pressure to get a carcass off the beach.

It should be borne in mind that there is a degree of physical danger involved for those who handle live stranded marine mammals. Cetaceans are powerful and may thrash about, and there have been cases of people who have been injured by being hit by an animal's tail (G. Early, pers. comm., 1989). Pinnipeds can be aggressive, and those responding to such strandings should take precautions against being bitten. Such bites are not uncommon (J. Antrim, pers. comm., 1989 and J. Roletto, pers. comm., 1989). Over 140 bites have been recorded from handlers engaged in the rescue and rehabilitation of pinnipeds on one section of the California coast (R. Jones, pers. comm., 1989). In addition to the physical wound, such bites carry the attendant danger of infection and disease transmission common to any type of animal bite.

There are less obvious physical risks which may also be encountered. There have been cases of hypothermia in people responding to mass stranding events. Also, physical exertion can precipitate other injuries. If it becomes necessary to move an animal, respondents should be aware that the animals are heavy, and the physical risks involved in lifting any heavy object can occur, e.g., back injuries, hernias, etc. One facility, recognizing the possibility of heart attacks, has established a policy that no individual should lift a load heavier than 50 pounds without assistance (G. Patton, pers. comm., 1989). The Victorian Whale Rescue Plan even alerts people to the possibility of drowning if they are unfamiliar with tide or current patterns (Anon., 1984).

Assessments of the possibilities of physical injury vary. One individual said that at least minor injuries have occurred in almost every live stranding event that his institution covered. Another said that he could not recall a single injury. In a jocular fashion, one person said, "We need to tell people to stay away from one end of cetaceans and the other end of pinnipeds." A number of guides and protocols mention the possibility of injury and the measures which should be taken to minimize risks (Royal Society for the Prevention of Cruelty to Animals, 1988; Anon., Marine Mammal Rescue, 1986(?); California Marine

Mammal Center, 1986; and International Fund for Animal Welfare, n.d.). None of the regional stranding directories, however, addresses the issue. Nor is there evidence that efforts have been made to remind Network members of safety measures periodically. There seems to be an implicit assumption that all members are specialists who should be aware of the risks. That is not the case, however. There are both volunteers with little background being used by some of the members and individual respondents with limited knowledge who may only occasionally respond to a stranding event. Out of necessity, the void has been filled by those institutions which use non-specialist volunteers. They have made an effort to inform their volunteers of the risks and trained them in safety protocols. At a minimum, an effort should be made periodically to reinforce Network members' awareness of safety precautions. The potential danger of physical injury should be covered in directories and any general protocols which are issued.

Even less attention has been paid to the possibility of disease transmission from marine mammals. There are a number of pathogens common to both marine mammals and humans. They vary from the unlikely, e.g., lobomycosis, to the relatively common, e.g., sealfinger. There are also diseases which could present danger to domestic livestock. It should be recognized that stranded animals are likely to be unhealthy and may serve as a reservoir of zoonoses. The possibility of disease transmission exists at the time of an initial response, during rehabilitation of live stranded animals, and while working with tissues from dead animals. A number of different diseases have been transmitted to humans by stranded animals, and there are other diseases which are pathogenic to both for which there are no records of disease transmission. There are treatment protocols for most of the diseases, and there have not been any reported cases of severe complication from strandings. Because of the exotic nature of some of the diseases, however, physicians should be alerted whenever an individual is ill and has been in contact with marine mammals.

There are a number of zoonoses which have been directly attributable to stranded marine mammals. Perhaps the most common of these is sealfinger--a disease for which the etiologic agent is uncertain. It can cause localized pain and swelling in the joints near the entry point and can be serious if not treated. It responds readily to treatment with tetracycline (Sargent, 1980). Network members responding to live pinniped strandings have contracted the disease (G. Early, pers. comm., 1989 and J. Roletto, pers. comm., 1989). It is common enough that rehabilitation facilities are aware of the risk and alert those who handle pinnipeds. Because of its prevalence it is readily diagnosed and treated. It does, however, present a potential danger to members of the general public who may attempt to handle stranded animals.

Similarly, sealpox has been transmitted to those handling pinnipeds (Hicks and Worthy, 1987 and J. Roletto, pers. comm., 1989). Sealpox can cause lesions similar to milker's nodules in humans but is not considered to be a serious disease. Hicks and Worthy, 1987, place it in the category of nuisance zoonoses. Their paper, however, does demonstrate the possibility that the disease can be transmitted to other animals in a facility. Gray seals (Halichoerus grypus) using the same concrete tanks which had been used by infected gray seals the previous year developed the disease.

In 1979-80 there was an epizootic in harbor seals (Phoca vitulina) along the New England coast which may have resulted in the mortality of 3-5 percent of that population. The majority of the animals which died had acute pneumonia and were immature. An influenza A virus (H7N7) was isolated from tissues of the animals (Geraci et al., 1982). After an infected seal sneezed directly into the face and eye of one researcher, severe conjunctivitis developed. Four other people who were performing necropsies on the seals contacted conjunctivitis after exposure, but serum samples taken later showed no antibodies to the virus isolated from the seals (Webster et al., 1981). The report noted, however, that "absence of serologic conversion after a viral infection of the eye is not unusual; the eye is a 'privileged site,' and infection can occur without induction of a

systemic immune response." The latter cases should be classified as a probable transmission.

The researchers may have come across another potential impact of influenza viruses in marine mammals. They observed that the virus was antigenically similar to an avian influenza virus, A/ Fowl plague/Dutch 27 (H7N7) (Geraci et al., 1982 and Webster et al., 1981). From June 1982, through March 1983, there was another outbreak of pneumonia in harbor seals in New England. Sixty dead animals were reported to the New England Aquarium through the Stranding Network. Samples again yielded an influenza A virus strain. It was identified as subtype H4N5--a strain which had previously been identified in avian species. It was replicated in the intestinal tracts of ducks after oral inoculation (Hinshaw et al., 1984). In 1984, two more influenza A viruses of the H13N2 and H13N9 subtypes were isolated from sick pilot whales (Globicephala melaena). The whale viruses were antigenically and genetically close to H13 viruses from avian species. Rectal inoculation of ducks produced viral replication (Hinshaw et al., 1986). Although there has been no documentation of the transmission of influenza A viruses from marine mammals to domestic poultry, the potential does exist, and individuals responsible for the operation of the Networks should be aware of it if another epizootic of a similar nature occurs.

On the west coast there have been periodic outbreaks of leptospirosis (Leptospira interrogans pomona) in pinnipeds (Gage, 1989). The pathogenic potential of the disease for humans has been recognized:

> "Leptospirosis in California sea lions must be considered important from a public health standpoint if we speculate that the sea lion can act as a reservoir for human infection. Once the disease is diagnosed in sea lions, precautions should be taken to prevent dissemination of contaminated urine by the use of handler protective hand and foot gear and sterilization of premises and fomites. If the disease occurs in the wild such as this (1984) epizootic, state and local agricultural officials, public health officials and the public should be alerted to the potential hazards" (Dierauf et al., 1985).

Leptospirosis has been transmitted from sea lions to humans in at least three instances. All involved individuals handling fluids or tissues (Smith et al., 1978). It should be noted, however, that hundreds of sea lions with the disease have been treated by many humans and there are no recorded cases of transmission caused by casual contact. With reasonable hygienic precautions, the zoonotic potential of the disease can be minimized.

Perhaps the greater danger is that the disease could be transmitted to healthy animals in a display facility. It has been shown that leptospires can be shed in the urine for up to 154 days (Dierauf et al., 1985).

Pinnipeds have also apparently transmitted Erysipelothrix rhusiopathiae to humans. The bacterium was isolated from 12 of 116 bite/abrasion wounds sampled from animal handlers at the California Marine Mammal Center. Both pinnipeds and cetaceans can contact the disease which may be picked up from fish in their diet. The CMMC study also isolated the bacterium from fish meal. Although erysipelas can be a serious disease, it responds readily to a number of antibiotics (Suer and Vedros, 1988).

A volunteer for the California Marine Mammal Center contracted a gastro-intestinal disease that was diagnosed as Aeromonas hydrophilia that the physician suspected might have originated from a pinniped (California Marine Mammal Center, 1987).

Stranded animals have also served as a reservoir for Salmonella. Several types of Salmonella have been isolated from stranded sea lions (Schroeder et al., 1973). People working at a rehabilitation center have picked up Salmonella (J. Roletto, pers. comm.,

1989). Researchers working with the carcasses of dead stranded animals have also contacted salmonellosis. One individual reported that four researchers had contacted the disease from "rotten" animals. He also commented that carelessness in working with the tissues may have been a factor in contacting the disease (S. Sadove, pers.comm., 1989).

From the foregoing accounts, it is evident that a carcass from any dead animal is a potential source of pathogens, and individuals working with tissues from dead animals should be aware of the possibility of disease transmission. When researchers working with animals from the 1987-88 dolphin die-off contracted throat lesions, there was considerable concern (C. Potter, pers. comm., 1989). One researcher felt that the possibility of disease transmission is serious enough that a protocol should be developed for handling tissues from stranded animals (R. Jones, pers. comm., 1989).

There are other instances of the transmission of disease from marine mammals to humans which cannot be tied to stranded animals. It should be assumed, however, that stranded animals could also transmit the diseases.

Blastomycosis was transmitted from a captive bottlenose dolphin to the attending veterinarian. The disease responded to antibiotic therapy (Cates et al., 1986). Another mycotic disease, lobomycosis, has occurred in both humans and stranded bottlenose dolphins, but a person from the Center for Disease Control informed the Mote Marine Laboratory that it is extremely difficult to transmit the disease, and reasonable precautions are all that is necessary to prevent infection (G. Patton, pers. comm., 1989).

Toxoplasmosis has been reported in a stranded northern fur seal (Holschuh et al., 1985) and in an Australian sea lion pup (Neophoca cinerea) (Fay, 1989). In the latter case, positive titers were found in animal handlers in the park.

Perhaps worthy of a more extensive discussion are the marine caliciviruses. Thirty-two serotypes of marine origin have been isolated. They have been found in both cetaceans and pinnipeds (Smith et al., 1983 and Smith et al., 1986). A series of studies have been conducted on San Miguel sea lion virus (SMSV) since 1972. Researchers exposed to the viruses developed type-specific antibodies to two serotypes (Smith et al., 1978). In 1985 SMSV-5 was isolated from blisters on the hands and feet of a researcher (Poet and Smith, 1989 and Smith et al., 1989). In addition, a number of calicivirus serotypes can be routinely propagated in primate cell lines leading the researcher to conclude that caliciviruses have pathogenic potential for humans (Smith et al., 1986 and Smith et al., 1989).

As indicated, the number of documented cases of calicivirus transmission from marine mammals to humans is small. There is potentially a more serious problem, however. SMSV has been declared indistinguishable from vesicular exanthema of swine (VESV) (Smith et al., 1974). Between 1932 and 1952 this serious livestock disease was confined to California. Between 1952 and 1956 the disease spread throughout many of the pork producing areas of the United States and necessitated drastic measures including slaughter of afflicted animals and strict quarantine measures (Smith et al., 1989). During the early 1980s, a calicivirus indistinguishable from VESV was found in dairy cattle in Oregon. Marine mammals along the Pacific coast showed antibodies to this virus, lending support to the theory that it was of marine origin (Smith et al., 1986).

Another calicivirus (CCV-Tur-1) was initially isolated from a bottlenose dolphin which apparently infected a California sea lion. When the sea lion was moved to a second facility a second dolphin became infected (Smith et al., 1983). The possibility of interspecies transmission and the infection of healthy animals should be considered if an animal is diagnosed with a calicivirus.

Finally, there are a number of disease agents which are common to both humans and marine mammals for which documentation of interspecies transmission is lacking. Such diseases are potential zoonoses.

In 1985, three harbor seals at the California Marine Mammal Center contacted gastroenteritis and Plesiomonas shigelloides was isolated from rectal swabs. Plesiomonas shigelloides causes similar gastro-intestinal problems in humans (Koski and Vandenbroek, 1986). In this case, one individual opined that the disease was transmitted from humans to the seals rather than the other way around (J. Roletto pers. comm., 1989).

Vibrios are bacteria that are part of the normal flora in the marine environment. Over thirty different species have been identified. Some species are pathogenic in humans, and they range from mildly to highly pathogenic (Blake et al., 1979). Vibrio alginolyticus which can cause mild disease conditions and Vibrio parahaemolyticus which has caused fatalities have both been isolated from a wide variety of cetaceans and pinnipeds (Buck and Spotte, 1986). The bacteria have been isolated from both live and dead stranded animals. Six species of vibriones were isolated from bottlenose dolphins which stranded during the mass mortality of 1987-88. In addition to V. alginolyticus and V. parahaemolyticus, two other species highly pathogenic to humans were isolated--V. damsela and V. vulnificus (Geraci, 1989).

It should be emphasized that there has been no known vibrio illness in humans caused by contact with a marine mammal. The potential for contact does exist, however, and researchers have alerted those handling stranded animals to be aware of the risk (Buck and Spotte, 1986; Schroeder et al., 1985). To repeat one of the admonitions:

> "The potential for human acquisition of infections of Vibrio from dolphins exists. Species of Vibrio may be both primary and/or opportunistic pathogens in dolphins, therefore, people who maintain and deal with dolphins or come in contact with stranded dolphins must remain constantly aware of the zoonotic potential of these organisms" (Schroeder et al., 1985).

A series of other human pathogens have been isolated in surveys of the microflora of stranded animals. Buck et al. (1988) isolated Streptococcus faecalis, Candida albicans, Klebsiella pneumoniae, Pseudomonas aeruginosa, and Staphylococcus aureus from three stranded Atlantic white-sided dolphins (Lagenorhynchus acutus). Klebsiella pneumoniae has also been isolated stranded California sea lions (Zalophus californianus) (Sweeney and Gilmartin, 1974). Staphylococcus aureus has been isolated from harbor seals (Geraci et al., 1982), Steller sea lions (Eumetopias jubatus) (Stroud and Roffe, 1979), and bottlenose dolphins (Streitfield and Chapman, 1976). In the last case, both dolphins and aquarium personnel had infections, but it was concluded that transfer between species had not occurred because there was a difference in the sensitivity of the bacteria to a range of antibiotics.

Having enumerated a number of potential zoonoses and related the possibility of injury, it might be possible to be unduly alarmist. Several individuals have related incidents where the fears of local authorities that stranded marine mammals presented a threat to public health have limited access to animals. Exaggerated assessments of hazards could well inhibit the operation of the Networks. Both injuries and the transmission of zoonotics have been relatively rare, and with reasonable precautions, e.g., the wearing of gloves, zoonoses can be minimized. Furthermore, if properly diagnosed, most of the diseases respond readily to medication. Participants in the Networks should be apprised of the potential risks, however, even if they are minimal.

There is another question for the agency relating to this issue. Does the granting of what is, in essence, a license make the agency liable for injuries or the transmission of disease

even if the participant has volunteered and is cognizant of the risks? Several institutional representatives were almost fatalistic about the issue. Two of them said that it is virtually inevitable that a suit will be filed (G. Early, pers. comm., 1989 and S. Sadove, pers. comm., 1989). One individual expressed the opinion that potential liability is the most serious problem facing the Networks and could eventually destroy the entire system. To insulate themselves from possible lawsuits, several organizations require volunteers operating under their Letters of Authorization to sign waivers of liability. They were quite candid, though, in relating that their attorneys had informed them that, depending on the circumstances and the judge, such waivers might be of limited utility. They did feel, however, that such waivers would deter frivolous suits.

There is potentially a second area of liability unrelated to medical problems, i.e., the actions of Network participants during a stranding. It is possible that irresponsible actions could affect private property or even violate laws. There have been some minor incidents in the past, but there has been no litigation. As an example, there was friction generated when a gray whale carcass was buried in a dune area in violation of a dune protection law.

To date, NMFS has avoided addressing the issue of liability, but it should be part of the equation if the agency weighs potential costs against benefits. In approximately a decade of operation, the agency has not had to litigate such a lawsuit. In some ways that is a tribute to the good will and responsibility of both Network participants and those who have been affected by their actions.

RECOMMENDATIONS

1. Network participants should be informed of the possibility of injury or disease transmission. The risks should not be exaggerated but presented in a straightforward manner. All directories, guides, and protocols should contain a section with recommended safety measures. In addition, people should be reminded to inform their physician that they have been in contact with marine mammals if they become ill so that diagnosis and treatment are facilitated.

2. No safety protocol should be prepared for those working with tissues from dead marine mammals. Researchers should already be aware of the possibility of disease transmission from such tissues and the measures necessary to minimize risks. There is little that the agency can do to prevent carelessness by knowledgeable individuals.

3. Network coordinators should identify and notify the appropriate health and agricultural authorities if an epizootic occurs which could have an impact on human health or domestic livestock. Local authorities should be made aware of the limited probability of such an event. Unwarranted fears may inhibit the operation of the Networks, and if such authorities know that they will be notified if there is a potential danger, cooperation with the Networks may be enhanced.

4. As is discussed below in the section on rehabilitation, in order to prevent the transmission of disease to healthy animals, marine mammals brought in for rehabilitation should be isolated from other animals until disease conditions are treated. Special care should be taken with sanitation and hygiene.

5. A waiver of liability provision should be added to Letters of Authority.

STRUCTURE AND ORGANIZATION

The membership in the Networks varies by Region. The membership in each of the Regions has been influenced by and, to some extent, mirrors the arrangements for responding to strandings which existed at the time the Networks were formalized. In most Regions membership is limited to institutions; however, because much of the pre-Network work was being done by individual researchers, the Southeast Region grants membership on an individual basis. In California, the State Department of Fish and Game had developed a detailed response program, and the current regional structure reflects the earlier operation including animal control agencies for the disposal of carcasses. Similar pre-Network structures have been carried through in other areas.

Some dissatisfaction has been expressed over the way in which membership is determined. Individuals in virtually every Region expressed the view that Networks included unqualified individuals and that reporting was less reliable than it should be. This observation should be qualified by noting that individuals were often referring to work beyond Level A data. In some instances, however, there were questions as to the validity of even Level A data. At the opposite extreme, there were a smaller number of comments about the difficulty in obtaining membership.

Perhaps those comments reflect the fact that none of the Regions has formal criteria for membership. In some Regions there are informal guidelines, but there is wide discretion in determining whether or not an applicant will be accepted. As an example, the Southeast Region has requested that applicants provide information which gives their qualifications. The NMFS person working with the Network said that they look for scientific, veterinary, or marine mammal background, but he readily admitted that there was little quality control and that someone with a general biological background might qualify despite having little or no expertise in marine mammals or strandings. Under such circumstances, there is a need for training even in such basic areas as species identification (J. Brown, pers. comm., 1989).

The relative ease in gaining membership has varied by region from lenient in the Southeast to relatively difficult in the Northwest. In the latter instance, an institution which had been extensively engaged in research on stranded marine mammals before the formation of the Networks was unable to get a designation until after it had a contract from NOAA to conduct a study utilizing tissues from stranded animals (J. Calambokidis, pers. comm., 1989).

The primary considerations in granting Network membership seem to have been an indication of interest and willingness to respond, an informal assessment of the applicant's capability, and the ability of the applicant to fulfill a perceived need, e.g., coverage of a geographic gap. Although the process has not been challenged, the lack of formal criteria creates the possibility that decisions could be arbitrary. Furthermore, it also inhibits objective evaluation of performance.

Both the Northeast and the Southeast Regions have indicated that they would be more comfortable if formal criteria were adopted. As a part of this review process, the Northeast began working on suggested criteria. They include:

> a. Applicants must be institutions. Among the reasons for such a requirement is that an institution will have the wherewithal to respond in a systematic fashion. It is more difficult for an individual to guarantee that funding and necessary equipment

will be available. In addition, it is easier to guarantee quality and consistency of reporting. The resources available to an applicant should be evaluated in the process.

b. The applicant must be willing to respond to all calls regarding beached and stranded animals within their geographic area.

c. The facility should have resources available to provide short-term temporary holding of marine mammals for rehabilitation or have access to another facility for this purpose.

d. The institution should have medical care staff or a cooperating veterinarian.

e. While it is not expected that stranding facilities meet APHIS regulations for the public exhibition of marine mammals, the facility should meet basic husbandry standards such as being able to (1) control coliform levels; (2) provide high quality food; (3) control temperature, salinity of water, and light; and (4) provide pools adequate to hold an animal on a short-term basis.

f. The applicant must agree to the responsibilities put forth in the Letter of Authority.

g. The applicant must not have any violations of Federal or State laws (T. McKenzie, pers. comm., 1989).

Although the suggested criteria have been molded to fit the idiosyncracies of the Northeast, i.e., a Network member is given responsibility for all stranding activities within a specific geographic area, they provide some basic concepts which may be useful in establishing criteria.

With the exception of the Southeast Region, the common practice is for membership to be granted to institutions. Even in that region, the most consistent members of the Networks are individuals who are affiliated with institutions. In addition to the points raised by the Northeast, an institution is more likely to maintain tissues in a properly curated manner. On the other side of the argument, the driving force behind an institution's active participation is often a single individual, and the loss of that individual could affect an institution's willingness to respond. This is particularly the case with academic institutions where an extensive marine sciences program is not present. In addition, the experts in an area may be most interested in specific species on which extensive research can be done. More common species may be ignored. An enthusiastic and well-trained non-professional may be more willing to respond to strandings of common species.

Certainly, an applicant's capabilities and willingness to respond are factors which should be considered before the issuance of a Letter of Authorization. If a Network designates individuals for different levels of response, e.g., individuals whose basic role is to report only Level A data, having financial resources may be less important than being able to identify such things as species and sex of an animal and to take proper measurements. For such individuals a demonstration of competence or some sort of training may be necessary. Two individuals suggested that an initial Letter of Authorization be issued for a probationary period so that performance can be evaluated. They also suggested that a new member be required to work with a more experienced member for a period of time (J. Reynolds, pers. comm., 1989 and S. Sadove, pers. comm., 1989).

Criteria for individuals responding to live strandings or who intend to conduct research using tissues from dead stranded animals may need to be more rigorous. In such cases, having adequate financial resources and access to equipment are much more important.

The issue of minimal standards for facilities engaging in the rehabilitation of animals is discussed below under rehabilitation.

Without formalized criteria, the agency risks being arbitrary and capricious in determining whether an applicant should be granted a Letter of Authorization. A decision could be subjective and based on the whim of the individual handling the application. The author was contacted by an individual who had been told that she was ineligible for a letter. She asked on what basis a determination is made. Although the decision may have been justified, it is possible that a previous interaction between the individual and the agency may have prejudiced the response. In other regions, there are indications that if an area is adequately covered, even a well-qualified individual might be rejected. One researcher expressed concern in this area and offered the opinion that NMFS was, in essence, granting monopolies for access to tissues from stranded marine mammals. The development of objective criteria would provide guidance for those who have to make the decisions and minimize the possibility that an unfair determination is made.

Just as there are no formal criteria for deciding membership, no effort has been made to evaluate the performance of Network members. Several individuals indicated that such an evaluation process is necessary. There are two obstacles to such a process.

First, the Network members are not notified as to what is expected from them. Even though the Network is voluntary, participation should be contingent to some degree on performance. Implicit in the granting of Letters of Authorization are two primary assumptions--that the applicant will respond and that the applicant will file reports. If a Network member only responds when he or she is motivated and fails to file the stranding reports, one of the primary purposes of the Network is undermined. Although some Network members expressed the view that membership entailed a responsibility to perform research and make the results of such research available, NMFS is really limited to making sure that Level A data are reported. One Network member suggested the following questions as a means of evaluating performance:

> "1. Do members respond and how quick is the response?
>
> 2. Are members submitting stranding reports?
>
> 3. Are the reports accurate?
>
> 4. Are members depositing tissues in accredited institutions?" (J. Heyning, pers. comm., 1989).

Although the fourth category may be beyond basic Network participation, it does touch on an area that should be added to the list, i.e., does the member cooperate with other members of the Network?

The second obstacle to evaluation is the lack of a termination date on Letters of Authorization. If Letters had to be renewed periodically, there would be a compulsion to examine a member's performance. At a minimum, any member who had lost interest would be culled from the list. Several Network participants indicated that Letters should be issued with limited durations. Their suggestions varied from annual renewal to renewal every 5 years. One individual suggested that the length be adjusted based on previous performance--a new participant would have a shorter period than a long-time Network participant. In each instance, they suggested that a peer review panel be set up to make a recommendation to NMFS.

To date almost no members have been removed from the Networks. Even when there have been problems, the lack of standards has made the removal of a member difficult. Removal from the Southeast Network occurs only when notice is given that an individual can no longer participate, e.g., the person has moved out of the area or has been replaced in an institution. It was suggested that NMFS would be reticent to remove anybody in the Region because it might create gaps in the coverage.

Except in the Southeast, the Network coordinator is a person assigned by the NMFS regional office. In most instances, dealing with the Stranding Network has been a task which has been added to other duties, and stranding activities often take second place behind other responsibilities. Basically, such people have only collected reports and have devoted very little time to improving or evaluating the operation of the Networks. The turnover rate in personnel has also been a problem. People on the west coast stated that the lack of stability in the position of stranding coordinator has created problems. One individual barely gets his or her feet on the ground before somebody new is assigned to oversee the Network. At times commitments have been made but not kept because of changes in personnel.

STRUCTURE BY REGION

In the Northeast, responsibility is regionalized. The Letterholders are given responsibility for a specific geographic region (normally corresponding with state lines) and respond to all strandings in that area. Other participants operate under the authority and direction of the designee in a particular region. In some areas, a formal system of sub-designees has been worked out to handle unusual or geographically isolated strandings.

The organization which has been designated for a specific area is responsible for filing reports. Although the provision in Letters requires reporting of stranding events within 30 days, the agency has asked that stranding reports for cetaceans be sent directly to the Smithsonian Institution. NMFS has been less than conscientious in receiving and compiling reports on pinniped strandings. Until recently, no effort was made to register tissues taken from dead stranded animals. To some extent, this reflected the evolution of the Network in the Northeast. Until February 1989, the Network was operated by the NMFS' Enforcement Division and the priority was enforcement and disposal rather than management. Since responsibility was transferred to Protected Species personnel, some reorganization of the Network has taken place, including recruiting additional letterholders in the mid-Atlantic area and establishing new reporting procedures.

Each of the Letterholders in the Northeast must provide facilities for rehabilitation of stranded animals or have an arrangement with another facility for this purpose.

The Northwest has also regionalized responses and designated a lead organization in each of five geographic areas as a "primary response center." In theory, no action is taken until a primary response center assigns the stranding to someone. In actuality, a good deal of sub-regionalization has taken place. Individuals at the Whale Museum, Cascadia Research Collective, and the National Marine Mammal Laboratory all stated that local authorities and others contact them directly rather than going through a primary response center. A number of facilities have been designated for rehabilitation of live marine mammals. Not all of the facilities engaged in rehabilitation have been formally designated.

Stranding reports are sent to the NMFS Regional Office in Seattle. In addition, participants are asked to keep a telephone log of reports and actions taken. Depending on who has received the report, the telephone logs may provide basic data such as species even if there is not an active response. The stranding report form contains a section for the registration of any parts taken from a dead animal. All parts from a single animal are assigned a unique identification number by the Regional Office.

In the Southeast, Letters of Authorization are issued to individuals rather than institutions. In both Florida and Texas, a large number of individuals participate in the Network. Along the northern Gulf of Mexico, there are relatively few Network members. The coordinator of the Network is a private individual. An area coordinator is designated for each of the states. Reflecting the sparse number of participants in the northern Gulf, a single individual is listed as the coordinator for all of Mississippi and Louisiana. In Florida, there is a degree of regionalization. Individuals are listed by geographic region in the directory. Texas has a much more structured sub-regional Network. It is divided into six regions. A single agency or institution has been designated as the lead organization within each of the six sub-regions. With one exception, all members of the Stranding Network in Puerto Rico and the Virgin Islands are government officials.

Stranding reports are submitted to the Network coordinator who follows up on reports and has prepared a data base for compiling the reports. On a quarterly basis, the Network coordinator sends reports of strandings to each of the Network members including the NMFS regional office. In Florida, participants are asked to contact the Network coordinator immediately in the case of live strandings.

Because strandings in the Southeast tend to be limited to cetaceans, handling of live stranded animals differs from those regions where the majority of live stranded animals are pinnipeds. To date, rehabilitation efforts have not been too successful with cetaceans and they are likely to have a longer recovery period. There are a number of aquaria in coastal regions in the Southeast, and the standard practice has been to transport live stranded animals to the nearest of these with adequate facilities. Sea World in Orlando has served as a backup if there should be difficulty and has been willing to provide transportation for even animals as large as a juvenile Bryde's whale. Often nearly superhuman efforts are expended to keep such animals alive. Perhaps because it is unusual for a cetacean to survive, NMFS' Southeast Region makes little effort to monitor animals undergoing rehabilitation. Only informal reporting via the telephone occurs. Nevertheless, some animals have survived, and there are instances in which the agency has no formal record of animals in captivity.

The Letters of Authorization do require that hard parts from any stranded marine mammal be registered with the regional office. Despite several extensive collections, however, only one Network member has registered any parts from dead stranded animals within the last three years.

The portion of the Southwest Network on the California coast is divided into six regions. Of all of the Networks, it has the greatest degree of specialization. The respondent to a stranding situation may differ depending on whether it is a cetacean or pinniped which has stranded and whether or not the animal is alive. In Hawaii, the Network is divided into the most obvious units, i.e., the individual island.

Stranding reports are filed with the NMFS regional office and the Region has developed a data base which enables the agency to track a number of variables. The Southwest is the only Region in which there has been a systematic effort to use strandings for management purposes.

Efforts to rehabilitate animals are more extensive in the Southwest than elsewhere. A supplementary report is required from rehabilitation centers when they receive an animal, and the Region requires that any change in the status be reported, i.e., death, transfer, or release of an animal. The Region provides orange tags for animals released back to the wild. It is the only Region that can provide accurate data on the number of animals reintroduced to the wild.

Non-scientific participants are required to register any marine mammal hard parts which they retain. This provision does not apply to those who are collecting parts for scientific research or for properly curated scientific collections, however. The majority of tissues from dead stranded animals are in the possession of such institutions.

LETTERS OF AUTHORIZATION

In each of the regions except one, participation in Stranding Networks is determined by receipt of a Letter of Authorization issued by the NMFS regional office with jurisdiction for the area. Such Letters are issued under the aegis of §112(c)of the Marine Mammal Protection Act. Reflecting the differences in emphasis among the Regions, there are differences in Letters of Authorization.

The Northwest Region does not issue Letters of Authorization. The Regional Director explained their reasoning in a letter to Dr. Nancy Foster:

> "(T)he Northwest Region does not use LOA's as a means of designating members or directing their activities. During the formation of the Northwest Regional Stranding Network, we were advised by GCNW (General Counsel Northwest) that in the absence of formal delegation of authority from the Secretary and implementing regulations under Section 112 (of the MMPA), no authority exists at the regional level to enter into written agreements. For this reason our network was established as a cooperative effort between participants and state and local authorities that have the required expertise and agree to operate within our established guidelines" (Letter from R. A. Schmitten to N. Foster, June 1, 1989).

In discussions with personnel from the Northwest Region, they explained that private individuals within the Network act as agents of the Federal government under the direct authority and supervision of NMFS personnel. They also explained that such an arrangement facilitated removal of Network participants who failed to perform adequately. Such an arrangement also means that any parts salvaged from stranded marine mammals technically remain the property of the Federal government and are on loan to Network participants. The legal opinion referenced in the letter was apparently an oral opinion because the Region was unable to provide a copy of it. It is, therefore, difficult to properly evaluate the legal arguments presented.

Perhaps the author does not properly appreciate the legal niceties, but the differences between how participants operate in the Northwest and elsewhere are not readily apparent. In both instances, the agency is granting authority for individuals to take marine mammals in a specific set of circumstances. Furthermore, the granting of authority in the Northwest is clearly general. Since there is no individual granting of authority for each stranding event and the participants are not under the direct supervision of NMFS personnel, the legal justification may actually be more tenuous than would be the case if Letters of Authorization were to be issued.

In general terms Letters of Authorization in other Regions have different focuses. In the Northeast the major emphasis is live stranded animals and how they are to be handled. The Region has recognized that existing Letters are not totally adequate and has begun the process of revising their basic Letters. The primary emphasis in the Southeast is on obtaining tissues for scientific research. The Southwest Region addresses both areas. Because some of the activities of the Stranding Networks relate to policy in a general way, there should be a degree of consistency in some areas, e.g., requirements for the rehabilitation process or the handling of tissues should be the same in different parts of the country. Many of the elements of what might be a model Letter of Agreement already exist in one Region or another. Sample Letters are contained in Appendix E.

One of the primary justifications for the operation of the Networks is to obtain basic information on strandings. In each Region a letterholder is required to submit a stranding report to either the NMFS regional office or the Network coordinator. With minor exceptions the stranding report form is basically the same in each region (including the Northwest). It is based on the format developed by Dr. James Mead for the Smithsonian Institution and incorporates the information defined as Level A data by the 1977 Stranding Workshop. Because the timely receipt of such information is important, two of the Regions have provided a deadline for submission of the information. The Northeast requires submission of the report within thirty days. The Southwest requires that reports be submitted by the 10th day of the following month. There is no time limit in the Southeast Letter.

Reflecting the regionalization of the Network, the Southwest region specifies the geographic region for which the letter is effective. A similar provision does not exist in the Northeast Letter despite the fact that, in practice, respondents tend to respond only in certain geographic areas. No similar provision is contained in Letters from the Southeast Region.

To some extent each of the Letters refers to the necessity for cooperation with State and/or local officials. This is particularly important in the case of disposing of carcasses. The Northeast seems to place greater responsibility on the Network member for disposal. In the other regions, there is merely the requirement that members assist governmental officials in the disposal of carcasses. Certainly cooperation with such officials facilitates future operation of the Network--particularly if an individual has cut up a carcass to obtain specimen materials. To place the entire responsibility for disposal on a Network member, however, would inhibit response.

In many ways, the Letters in the Southeast and the Southwest are similar. When the format was prepared in the Southeast they adapted the format being used in the Southwest. As an example, both require permission from a landowner prior to entering a site. Both authorize the humane destruction of animals. Such a general granting of authority may be inappropriate in some instances. This is particularly true in the Southeast where a Network membership is on an individual basis. There are clearly Network participants who are not competent to euthanize animals, and such authority should be limited to veterinarians or other competent personnel. There is another situation where the adoption of the Southwest's format has created an anomaly in the Southeast. Although Letters are granted only to individuals and members of the Network have been told that the authority cannot be extended to volunteers, the Southeast Letter contains language stating that the participant will be responsible for any individual operating under the authority of the participant. Clearly such language was developed for institutional participants. None of these provisions is contained in the Letters issued by the Northeast.

Provisions relating to live stranded animals differ considerably from Region to Region. Both the Southwest and Northeast regions indicate that such animals will be returned to the wild after a rehabilitation period and make provision for the alternate disposal of such animals, i.e., transfer to another facility for public display. The Northeast requires an affirmative determination by NMFS personnel that an animal has been sufficiently rehabilitated before it is returned to the wild.

The Southwest Letter authorizes the transportation to a State licensed rehabilitation center. It should be noted, however, that the State of California has stopped licensing such facilities. The Southeast Letter contains a similar provision, but it provides authority to transport to an aquarium or other acceptable facility. Both the Southwest and Southeast place limits on the type of transportation which may be used to transport an animal.

The Southeast Letter contains little more on the rehabilitation of animals. Even reporting is limited to the line on the stranding form asking for disposition of the animal. Since stranding forms are submitted to a private individual in the Southeast, there is no assurance that NMFS will know that an animal is undergoing rehabilitation. As indicated above, there is a supplementary stranding report in the Southwest for live stranded animals taken in for rehabilitation.

Both the Northeast and the Southwest Regions require that animals be tagged before they are released to the wild. In the Southeast, Network members indicated that there was a degree of uncertainty as to whether tagging was allowed without obtaining a permit for scientific research.

The Northeast Letter of Authority only peripherally touches on the retention of parts from dead marine mammals. The reporting form requires that the field number, catalog number and institution be reported if specimen materials have been deposited in an institution. Since stranding reports on cetaceans are submitted directly to the Smithsonian Institution, the agency does not have a record of such materials.

Both the Southeast and the Southwest Letters provide that any hard parts, i.e., bones, teeth, etc., be registered with the NMFS Regional Director and that they be permanently marked with an identification number. As indicated elsewhere, though, the registration of such parts is the exception rather than the rule. The Southeast prohibits the transfer of hard parts unless consented to in writing by the Secretary of Commerce.

Both regions also prohibit the sale or trading of any animals or parts. Transfer of parts is not totally prohibited, however. Parts may be loaned to other scientific and educational institutions. In the Southeast, however, there is an additional proviso. The Letter states, "The recipient must be a member of the stranding network or they must join the network at the time the loan items are received." Such a provision may create problems and limit the accessibility to tissues by researchers. There is little purpose in requiring someone to join the Network unless they are committed to actually participating. Such a provision would also seem to preclude the transfer of specimen materials outside of the region.

There are two elements of a model Letter of Authorization that should be included but are not currently in any of the regional Letters. Although all Letters contain either an amendment provision or a termination provision upon written notice, they are apparently effective in perpetuity unless NMFS initiates some sort of action. Because periodic review is not likely to take place unless there is a termination date, such Letters should be effective for only a set period of time.

None of the Letters contains a waiver of liability provision. As indicated above, the agency may want to add such a provision as a deterrent to possible lawsuits.

UTILIZATION OF VOLUNTEERS

Even though all of the Networks are dependent on the voluntary assistance of Letterholders, the spirit of volunteerism is actually an even more pervasive part of the Networks. In every Region, institutions make use of their own volunteers to assist them in stranding activities. The utilization of volunteers varies from having individuals who can cover strandings for an institution in geographically isolated areas to rehabilitation centers which are almost entirely dependent on volunteers.

Only in the Southeast Region has the structure limited the use of volunteers. Members of the Network have been told that Letters of Authorization apply only to the individual to whom they are issued and that volunteers working with an institution are not covered (G. Patton, Pers. comm., 1989). Even in the Southeast, however, actual practice is that

volunteers are utilized by some of the institutions which respond to strandings. Some of the volunteers are used for logistic support. In the Florida Keys, one of the Network members has a list of volunteers with boats who are willing to transport respondents to the site of a stranding. The same individual also uses college students enrolled in a course on care of marine mammals (M. Rodriguez, pers. comm., 1989).

College students are also utilized in Texas, and there is a Stranding Network Club at Texas A & M University which helps respond to strandings in the Galveston area. The state coordinator commented that the students are very good because they are highly motivated. He pointed out, though, that because of the transient nature of students, an effort had to be made to periodically provide training (R. Tarpley, pers. comm., 1989).

In the spirit of "if it works, don't fix it," it might be useful for the Southeast Network to recognize that some people who are not letterholders are assisting in stranding situations and allow such a practice to continue (and maybe even encourage it) as long as such individuals are under the direct supervision of a letterholder.

The use of volunteers in other areas varies considerably depending on the institution. In geographically isolated areas, some institutions have employed volunteers to respond to initial reports and to make coverage more complete. The New England Aquarium has a number of such individuals (G. Early, pers. comm., 1989). At the opposite end of the country, the Whale Museum in Friday Harbor, Washington, is responsible for strandings on an archipelago and they have 28 volunteers located on individual islands (R. Osborne, pers. comm., 1989). The major purpose of such volunteers is reporting strandings.

A large number of letterholders have pools of volunteers who accompany them to stranding sites and provide assistance. The most extensive experiment of this nature has been set up to respond to mass strandings on Cape Cod. Operating under the authority of the New England Aquarium, the International Wildlife Coalition and International Fund for Animal Welfare have compiled a list of over 550 people willing to respond to a mass stranding event. The theory behind the Cape Cod effort is that even relatively untrained personnel can be useful if properly supervised. They can serve to check people in, provide coffee, drive people to the site, and assist others in providing first aid to the animals. Although in existence for 2 years, the contingency program has not yet been tested because there have been no mass strandings. The volunteers did assist during a minor oil spill, however (D. Morast, pers. comm., 1989).

Several facilities engaged in the rehabilitation of stranded animals indicated that they also use volunteers to assist them in animal care and husbandry.

The California Marine Mammal Center may have the best organized and most comprehensive volunteer program of any of the letterholders. Their entire program is virtually volunteer operated. Volunteers are used for responding to live strandings, providing care to animals undergoing rehabilitation, maintenance and construction of physical facilities, education programs, and office work. The Center has 17 paid staff members of whom 8 are full-time. By contrast there are 350 volunteers, and they are able to operate two full shifts of volunteers daily.

Of necessity, some of the institutions which utilize volunteers have developed training programs and protocols. Such training sessions involve things such as species identification, taking basic data from stranded animals, safety measures, and animal care. The materials used in such programs represent a resource which has not been fully utilized because, for the most part, they are limited to the individual institutions which have prepared them.

Just as the question of liability is present for the Network generally, the use of volunteers raises the same issue for some Network members. In part, the training programs have been developed to limit the potential for injuries. A number of the organizations also require volunteers to sign a waiver of liability. The New England Aquarium has entered into formal agreements with the other organizations involved in the Cape Cod Stranding Network. The organizations are sub-designees under the New England Aquarium's Letter of Authorization and have agreed not to sue the Aquarium.

ROLE OF GOVERNMENT AGENCIES

There really is no way to generalize the role of State and local governments or other agencies within the Federal government. In many areas they are a major component of the Networks. In others they play almost no role at all. It often depends on the interest of an agency or even of a single individual. It should also be noted that it can be a function of the effort made to involve them. Where NMFS personnel have actively communicated with them, the degree of involvement has been greater, and in many areas the effectiveness of the Networks is directly proportional to the cooperation of other governmental entities.

At a minimum, police agencies or beachfront authorities are important because they are likely to receive the initial report of a stranding. If they are unaware of whom to contact or unwilling to contact them, there is a possibility that a stranding will never be recorded. A systematic effort is needed to inform them of the purposes and operations of the Network. Acting as a liaison with such organizations is a logical role for the person in the NMFS Regional Office who is responsible for the Network. Because of competing responsibilities, however, such an activity is usually a fairly low priority, and it is often the local Network member who makes an effort to notify enforcement agencies of the Network. Several Network members have a policy of putting out information at least annually. In areas where the Networks are weak, the lack of contact may very well result in a failure to notify anybody of a stranding.

Because of turnover in local agencies, it is important that such contacts be renewed on a periodic basis. Where problems occur, or where they are anticipated, a special effort should be made to contact such agencies. In the Southwest, when a local agency disposes of a carcass before it is investigated by a Network member, the Network coordinator makes an effort to contact the local agency to ensure cooperation in the future. The Region has also made an effort to actively involve local enforcement agencies and beach and harbor authorities as active members within the Network and lists them as cooperators.

Perhaps the greatest point of friction lies with local governments. When an animal strands, it often may be quite ripe and the primary concern is to get it off their beach. If the Network is to gain cooperation, it is important that responses be timely. It is also important to realize that failure to respond provides negative reinforcement. If the Network does not respond to a call, the chances that it will be contacted for subsequent strandings are diminished. Local authorities in two different states told the author that they do not bother to call because nobody shows up. As is discussed in detail below, responsibility for the disposal of carcasses after response to a stranding has also been a source of friction.

Just as NMFS has often failed to acknowledge the efforts of the Networks, the Networks themselves have also failed to acknowledge the importance of local agencies. Efforts should be made to enhance communication with such agencies and to give them the feeling that they are actively involved in the process.

Despite the few instances of friction with local governments, for the most part they are very cooperative. In some instances they have made special efforts to assist the Network. Often they provide resources to help those responding to stranding situations. A couple of

examples may be illustrative. The town of Eastham, Massachusetts, has volunteered its bus barn as an assembly point and the use of town equipment if a mass stranding should occur on Cape Cod. The maintenance division of the Los Angeles Department of Beaches and Harbors photographs dead pinnipeds when it picks them up for disposal.

Similarly, State agencies are a key component of the Stranding Networks in many areas. In some areas of the country, major portions of the shoreline are under State jurisdiction, and the cooperation of the agencies administering such areas is vital if strandings are to be recorded. With few exceptions, if personnel such as park rangers are aware of the Networks, they have made an effort to assist the Network.

In New York, State conservation officers work closely with Okeanos which is the Network representative for the State (S. Sadove, pers. comm., 1989). In one area in the Northeast, the relationship with a State government has been weakened as a result of a structural change in the Network. While NMFS enforcement personnel were responsible for the Network, they contracted with the State of Maine to receive stranding reports. The contract lapsed when responsibility for operation of the Network was transferred.

In the Southeast, State conservation and/or enforcement agencies are at least nominal members of the Network in each State. Actual participation is uneven, however. In both Florida and Texas, State agencies play a significant role. In Florida, both the Marine Patrol and the Department of Natural Resources are important to the operation of the Network. The Texas Department of Parks and Wildlife has been a major component of the Network and is the lead organization for one of the sub-regions in Texas.
Texas Sea Grant has also assisted with the preparation of printed materials.

Of all of the regions where there is private membership in the Networks, State involvement is perhaps most extensive in the Northwest. Agencies from both the States of Oregon and Washington play principal roles in strandings. The Washington Department of Wildlife is one of five designated primary response centers. The Oregon Department of Fish and Wildlife is one of nine designated principal participants. In both States, the State law enforcement agencies actively participate in forwarding reports to primary response centers. The Oregon Department of Transportation has assumed responsibility for the disposal of dead marine mammals on state beaches. Sea grant agencies in both States have helped provide printed materials instructing people to leave seal pups alone.

In both Alaska and Hawaii, reporting is shared between Federal and State officials.

A number of Federal agencies have either actively participated in the Networks or have provided assistance. Some of the shoreline areas under the jurisdiction of the National Park Service and the Fish and Wildlife Service have among the highest response rates along the entire coast. The principal respondents in two of the sub-regions in Texas are the Fish and Wildlife Service in the Sabine Pass region and the National Park Service in the Corpus Christi region. In other regions, however, places such as Wildlife Refuges do not necessarily report strandings (H. Neuhauser, pers. comm., 1990). In a number of areas, the U.S. Navy has been particularly cooperative in reporting strandings on their bases and providing equipment and personnel. In most cases, the Navy has assisted those who are in the Networks, but the Navy Ocean Systems Center has also been a key participant in southern California and Hawaii. In the case of other branches of the military, the record has been uneven. In some instances, military bases have been extremely helpful. In others, they have denied access to carcasses (in some instances because of classified work being conducted within the base) and even failed to report strandings.

Although it varies by Region and seems to be dependent on the commanding officer, the U.S. Coast Guard deserves special recognition. More than any other agency, they have exhibited a willingness to provide equipment and help with some difficult disposal

problems. In some areas, Network members request the Coast Guard to investigate initial stranding reports in remote areas before Stranding Network members actually respond.

As is the case with State agencies, the degree of cooperation with other Federal agencies is often a function of the effort made by NMFS personnel and Network participants to contact them. Such contacts should be periodic, and there should be an effort to involve such agencies in any meetings of Network members.

Two issues raised at the outset of the review have proven to be of less consequence than might be suspected. Although there have been stories of turf battles within the Networks in the past, such issues have been resolved as the Networks have become formalized, and tensions are the exception rather than the rule. To some extent this can be attributed to the designation of lead institutions in particular geographic regions and an effort to functionalize response. Even in areas where a lead organization has not been designated, informal divisions of responsibility exist among Network members although some members have indicated that more could be done to assist this process (Letter from G. Patton to D. Wilkinson, April 13, 1989). If an institution has a particular interest or possesses unique capabilities, it is the Network member most likely to be asked to respond. As is discussed below, the greater problem is finding enough qualified people so that all strandings are covered.

That is not to say that all problems in this area have been eliminated. A number of organizations in New England contacted NMFS expressing concern about one letterholder's lack of willingness to cooperate with others in a mass stranding situation. The institution involved is no longer associated with the Stranding Network. Disagreements are most likely in the cases of live strandings or strandings of unusual species. Clear definitions of responsibility and efforts to encourage cooperation can reduce the potential for such disputes.

A second issue raised fairly early in the process was the possibility of conflict of interest existing in the designation of Network members. Most often, this issue has been raised in relation to Network participation by aquaria. Some individuals in both the Southeast and Northeast Regions expressed concern that aquaria were using the Stranding Networks as a source of animals for display. This is discussed in greater detail below. In testimony at a public hearing on April 18, 1989, on the taking of bottlenose dolphins for public display from the Gulf of Mexico, the Animal Protection Institute raised the possibility that incentive may exist for not reporting strandings of that species because it could affect the quota of animals to be removed for public display. Response to strandings on the northern Gulf coast has been less reliable than in some other areas, but there are two complicating factors. First, the geography of the area makes responses difficult. Much of the shoreline is marshy and relatively inaccessible. Second, coverage is provided by relatively few individuals. There is a potential for a serious conflict of interest for those who are both Stranding Network members and collectors of dolphins for public display. The agency must weigh that potential against a reduction in respondents in an area where coverage is already inadequate.

It would be naive to assume that there is not an element of self-interest on the part of many Network participants. Some receive positive publicity for their efforts. Often there is an opportunity to conduct research which might not be possible if researchers did not have access to animals and carcasses. This issue was put into perspective by an individual who is not a letterholder but has closely followed the Network in the northeast:

> "Almost all of these folks are motivated to participate on a voluntary basis; they MUST have some incentive, MUST be allowed to achieve their goals. Scientists must own the data, aquariums must be allowed some 'back door' displays, the Cape Cod Volunteers need a successful release.... Face it, each of these active groups has

different reasons to participate, but NMFS has the mandate. Whom else will NMFS get to do the job they should but can't do?" (Letter from W. Rossiter to D. Wilkinson, August 28, 1989).

Having a personal motivation for participation in the Stranding Network does not constitute a conflict of interest if a respondent's self-interest does not conflict with the goals of the Network.

RECOMMENDATIONS

1. NMFS should appoint an individual in each Region to coordinate stranding activities. Such a position should not be an added responsibility for someone who has other responsibilities. The individual should be able to devote a major portion of his or her time to stranding activities. In many ways, the effectiveness of the Networks is dependent on the nurturing they receive. A NMFS person should not only be responsible for receiving stranding reports and compiling data but be able to provide some of the basic administrative and support functions. As an example, routine contacts with other governmental entities need to be periodic. Such a person should also be able to identify and act upon deficiencies, e.g., if a regional Network needs a species identification guide, NMFS should be able to provide such support. Such an individual should be able to travel in order to work with local people and to gain publicity for Network activities. Without such freedom, there is the possibility that the individual responsible for the Network will be focussed on the immediately contiguous area. When the NMFS Southeast Office, for example, discusses the Stranding Network, it is virtually synonymous with Florida. The person assigned to the Stranding Network in the Southeast will have to spend a considerable amount of time developing a functional Network on the northern Gulf of Mexico coast. Alternatively, the Region might be divided into sub-regions and a coordinator designated for each sub-region.

2. The Stranding Network coordinator in each Region (or sub-region) should be a NMFS employee. This is not meant to imply any criticism of the Network coordinator who is in the private sector. That person may have accomplished more in getting the Networks up and going than any other individual. Because the NMFS Regional Office is somewhat isolated from the information, however, it makes it difficult for the Region to fulfill its management responsibilities under the Act. Furthermore, without the stimulus of continual contact, Regional personnel may not consider possible applications of data from strandings for such things as fisheries management. For similar reasons, and so that NMFS is aware of live animals going into captivity and the disposition of parts from stranded animals, stranding reports should be filed with the NMFS Regional Office rather than with a third party. Finally, occasionally decisions must be made with the authority of the Government. A private individual does not have the authority to make decisions on behalf of the Government even though he or she may possess both the desire to find a solution to a problem and the necessary expertise.

3. In consultation with the central NMFS office, each Network should establish formal, objective criteria for membership. Because of differences in Network structure and available resources, no single national set of criteria is feasible at this time. If non-specialist personnel are to be utilized in any of the Networks, there should be a commitment to provide them with training and informational materials to assist them. If there is a division of activity, the criteria should reflect the differences.

4. To the extent feasible, Network membership should be limited to institutions. If individuals want to assist, they should operate as cooperators under the authority of institutions. Institutions should be able to use volunteers if they are properly trained and operate under their supervision.

5. Networks should establish methods for evaluating performance. At a minimum, these should include willingness to respond, filing of reports in a timely fashion, and filing of accurate reports.

6. Lead organizations should be designated for geographic areas. Where regionalization has taken place, jurisdictional disputes have been minimized and there has been a greater degree of accountability.

7. For the sake of consistency, all Regions should utilize Letters of Authorization to designate membership and to define responsibilities and limitations. If specific authorization is required for the Region not currently using this method, it should be provided.

8. A model Letter of Authorization should be developed by the NMFS legal staff in consultation with the Office of Protected Resources and the Regions. Consideration should also be given to asking for the input of the Smithsonian Institution, the Marine Mammal Commission, and the Fish and Wildlife Service. The Letter should be sufficiently flexible so that it can be adapted to different levels of response, e.g., rehabilitation language only for those who are appropriate. The model Letter should contain consistent requirements for reporting, handling of tissues from stranded marine mammals, requirements for rehabilitation of stranded animals, limitations on euthanasia, authority to tag, a termination date, and a waiver of liability provision.

REPORTING AND DATA

The 1977 Stranding Workshop emphasized the importance of having stranding coverage as complete as possible. Among the responsibilities assigned to the Regional Networks was to "assure an effective mechanism for response to every stranding" (Geraci and St. Aubin, 1979, emphasis added). Although commendable, such a goal is not universally achievable because of the difficulty in reaching geographically isolated areas or the limitations of resources.

Recognizing that total coverage is unlikely, there are a couple of lesser standards by which general Network performance could be measured: maximum attainable coverage and consistency. Year-to-year consistency is important if there is not to be a bias in conclusions. The measurement of unit effort is a key component in calculations, and, at a minimum, identification of possible bias and the limitations of data is an important task. In their handbook on human interactions, Hare and Mead (1987) emphasized the importance of both a maximum and consistent effort:

> "A consistent effort to examine all reported beached animals is imperative if there is to be a confident record of species frequencies and an unbiased monitor of human impacts. Immediate initial response to a reported stranding is important. A consistent effort shown by agencies responsible for strandings provides positive reinforcement to people in a position to discover and report events."

One of the purposes of maintaining records of strandings is to establish a baseline which will enable researchers and those responsible for resource management to detect unusual events, human interactions, and, in some cases, to serve as indicators of basic population parameters. If there is significant variation in the data and no effort is made to control for biases, the utility of establishing a baseline may be limited to detecting only very major changes.

This issue was recognized by Smeenk (1987) in attempting to use stranding records to document harbor porpoise trends in the Netherlands:

> "Fluctuations in stranding records may, within certain limits, be taken as reflecting long-term population trends of cetaceans in coastal waters. But in order to draw conclusions that are justified, one has to be thoroughly familiar with the circumstances and background of the recording scheme and with its possible biases."

Although unable to quantify such biases, he attempted to account for them in a general way in his conclusions:

> "...I believe that the gradual rise in stranded harbour porpoises reported to us since 1970 only reflects this increasing awareness among the authorities and the public at large, and thus an increasing observer effort. They cannot be taken as a sign that the harbour porpoise in our waters is on the increase again."

To date few systematic efforts have been made to measure response rates or to calculate unit effort within the Networks. There is evidence that the rate has improved for cetaceans since the formation of the Networks (Odell, pers. comm., 1989 and R. Ferrero, pers. comm., 1989). The record on pinnipeds is mixed.

If data from strandings are to be used for management purposes, an effort must be made to account for biases. There are a couple of examples of how efforts have been structured to verify response rates. Dr. James Mead used aerial surveys to check on initial stranding reports from within the Cape Hatteras National Seashore and determined that there was almost complete coverage (J. Mead, pers. comm., 1989). A systematic effort to cover beaches by walking in the central and southern portion of the sea otter range in California found that notification of strandings for that species was much less complete and pointed out limitations in passive response:

> "This study clearly indicates justification for systematic beach walks. First, the rate of sea otter carcass recoveries is higher when beaches are walked systematically. Second, a systematic effort results in normalized data that can be used to detect changes in mortality by season, sex, age, locality, and year. The end result is a much more satisfactory and useful index of mortality. Data obtained from passive salvage efforts are difficult to interpret because of varying and largely unknown effort" (Jameson, 1986).

To measure the passive response rate on sea otters, another researcher suggested that a sample of beaches be selected which would be monitored at frequent intervals. Carcasses would be marked to determine what the rate of public reporting would be and to get an idea of how long carcasses remained on the beach before being reported (Gerrodette, 1983).

To paraphrase Mead's three steps in getting a report recorded, a stranding must be observed and reported to someone who can contact the Network, a member of the Network must respond and collect basic data, and an accurate report must be filed and compiled. Short of taking the measures mentioned above, it is probably not possible to quantify biases in stranding data.

Jameson did observe, however, that the most important single variable in getting reports from the public was the level of public awareness (Jameson, 1986). To the extent that an effort is made to make the general public aware of how to initiate the process, such bias can be minimized and reaching the goal of maximum attainable coverage becomes easier. Without periodic reinforcement, however, the consistency may vary.

There are items which should be tracked over time to obtain an idea of the magnitude of possible reporting bias in the intermediate area. Both were suggested in the report of the 1987 Stranding Workshop:

> "Maintain records of calls not responded to, changes in operational procedures, and other factors that may change over time. The stranding networks are still in their infancy, and failure to keep good records of reporting and other procedures may make it difficult or impossible to detect or assess the significance of changes in the nature, frequencies, or locations of strandings" (Reynolds and Odell, in press).

Only the Northwest Region has systematically recorded those calls not responded to. Using telephone logs maintained by Network participants, it would be possible to calculate a percentage response. They make an effort to obtain species and location for strandings which are not covered by Network participants although such information must be considered less reliable than that provided by Network participants (B. Norberg, pers. comm., 1989). It should be noted that other Level A data, e.g., sex and length of the animal, are not normally available from telephone logs.

In the Southeast, it is impossible to monitor response rates with the current Network structure. No apparatus exists for noting calls to which there is no response. The Network is decentralized and calls may be made to one of several Network members in an area. If there is no response, there is unlikely to be any record of a stranding (J. Brown, pers.

comm., 1989). Florida may have the most extensive coverage of any state in the Southeast, but even though the State Marine Patrol makes an effort to contact Network members, there are a number of strandings which are not covered. One State official noted that in 1988 there were 60 reports to which no member of the Stranding Network responded. She said that strandings where attempts at notification were unsuccessful had previously not been included in the data base (L. Price, pers. comm., 1989).

In both the California portion of the Southwest Region and the Northeast, it is assumed that if a stranding is initially noticed and reported, there will be a response. In California, it is assumed that by including organizations such as agencies with jurisdiction over beaches and animal control agencies, reporting will be complete. As noted below, however, the assumption that reports will be filed is not always justified. Furthermore, there is a question as to the reliability of the reports which are filed by non-specialists. By contrast, the Northeast makes it a condition for each letterholder that there is a response to all strandings within their geographical region.

Individual Networks are normally aware of factors that affect reporting rates, but an investigator who is only working with compiled data may not be. Either the addition or the loss of an active member may produce stranding totals which vary from previous totals and could be interpreted as significant when the actual number of strandings has not changed. The improvement in Network coverage and greater public awareness have probably resulted in higher numbers of strandings being reported--particularly in the case of cetaceans. Other changes may have resulted in underreporting, e.g., until alternative measures become fully operational, the fact that the State of Maine no longer has a contract to report strandings may result in a reduction of reported strandings. A similar phenomenon occurred in the Pacific Northwest when the Washington Department of Game reduced its effort to obtain information from stranded pinnipeds (Scordino in Reynolds and Odell, in press). In some areas, the budgetary limits of specific letterholders could have an impact on response rates. Two letterholders in Florida indicated that the financial burden was such that they might have to limit their activities in the future. Similarly one institution in the Northeast indicated that it had no budget for marine mammal strandings. An effort should be made to note structural changes which affect reporting rates.

A number of factors affect the response rate to strandings and may influence baseline data. Among the most significant are geographic gaps in coverage and the interest of Network participants.

Geographic gaps are caused by both difficulty in reaching some areas and by shortage of Network personnel. Some of the gaps are caused by remoteness and lack of accessibility. Response rates in high-use areas generally are better than in low-use areas. Examples of areas that are difficult to cover include islands off the coast of California and Maine, barrier islands in the southeast, and parts of the coast of Washington. Without major expenditures, total coverage of such areas cannot reasonably be expected.

Other gaps are caused by a lack of volunteers or insufficient effort on the part of the agency to identify potential volunteers. For example, in the Northeast, there are no letterholders for Maryland and Delaware. This has probably not greatly reduced response rates because of the proximity of those coastal areas to the Smithsonian and because of the willingness of the letterholder from New Jersey to assist in strandings in those states. The Region has processed a request for membership from the National Aquarium in Baltimore and state agencies in Delaware and Maryland have expressed interest. This could help reduce the gap. The northern coast of California has reduced response rates both because of lack of volunteers and problems with accessibility.

With the exception of Alaska where logistical problems are almost insurmountable, the most significant gaps probably exist in the Southeast Region. There are gaps from the southern

half of North Carolina to the Florida border and along the northern Gulf coast including the Florida panhandle, Mississippi, and Louisiana. There are some Network members in the Atlantic coast gap but response is inconsistent. There are virtually no volunteers in the Gulf coast gap. The Network coordinator is cognizant of the problem. He wrote, "Some areas in the Southeast are incompletely covered (Louisiana, Mississippi, Florida panhandle, the Carolinas), reflecting the lack of volunteers in these areas and, more often, the limits of volunteerism" (D. Odell in Reynolds and Odell, in press). James Mead commented that these areas might be the only areas where the hiring of a NMFS employee to actually respond to strandings and work with others (as opposed to helping in general Network operations) would be productive.

There is a need for the Southeast Region of NMFS to actively work to find members for the Network and provide some supporting services. There is little evidence that the agency has considered such an effort to be a priority. Little action has been taken to approach universities, state agencies, and veterinary groups to see if there is interest. The problem is self-reinforcing. If there is no response, people do not bother to report strandings later. Both enforcement agencies and members of sea turtle patrols which periodically walk beaches indicated that they do not report strandings because little interest has been demonstrated.

There are a number of actions which could be taken to increase coverage in these areas. First, the agency itself has some resources in these areas. Three of its laboratories are located within these areas--at Beaufort, North Carolina; Charleston, South Carolina; and Pascagoula, Mississippi. If a portion of their activity could be directed toward covering strandings, some progress could be made. Other NMFS laboratories have played a key role in responding to strandings on the west coast. Both the La Jolla and Seattle laboratories are extremely active and the Galveston laboratory has assisted and provided support at times. Data that are important for management purposes could be obtained from the strandings in these areas. As an example, it would be useful to obtain information on two Atlantic stocks of Tursiops truncatus. Basic population, genetic, and contaminant information from the Atlantic coastal stock is important because of the massive mortality in 1987-88. Within the Gulf of Mexico, a more complete picture of human interactions is needed in order to set quotas for live captures for the public display industry.

The agency also could actively recruit volunteers for coverage. Ideally, such people would have a professional background in marine biology or veterinary medicine. It may be necessary, though, to make a judgment call. If such people are unavailable, is it worth attempting to recruit non-specialists? It should be understood that while coverage may be more complete, data may be less reliable. In either case, an effort will have to made to provide basic support services such as training and printed guides. One member in the Southeast Network commented that it might be necessary to work with a regional coordinator in each of the states. He pointed out that they would also need help with publicity--both to raise public awareness and to give a degree of credibility to the Network (R. Tarpley, pers. comm., 1989).

A second factor influencing the response rate in some areas is related to such things as the species and the condition of an animal. Some Network members are more likely to respond to a live animal than to a dead animal. Because of dependence on researchers and their interest, the chance of a response to a common species is less than for unusual species. For the most part, coverage of cetacean strandings is good throughout the country. Even cetaceans, however, are incompletely covered in some areas. Because strandings of bottlenose dolphins are relatively common in some areas in the southeast, a significant number are not examined by Network personnel (D. Odell, pers. comm., 1989). For a period of time, it was difficult to get people out for gray whale strandings in the Northwest (T. Gornall, pers. comm., 1989). The National Marine Mammal Laboratory then assumed

primary responsibility for gray whale strandings so that there would be consistent coverage.

The response to dead pinnipeds is much worse, and the agency must bear much of the onus. Sometimes subtly, other times directly, it has sent a signal that information from pinniped strandings is not important. The national office has not indicated any interest in the data, and there is no centralized data base. It is almost impossible to compile the data even from some areas where pinniped strandings are routinely covered. One individual commented that NMFS had asked them to collect data which ultimately occupied a lot of file space, but the agency has never asked for any of the information. There is an additional problem with the available data. Because untrained personnel respond to many dead pinniped strandings, even basic information such as species identification may be unreliable.

This lack of interest is carried through to the regional level. One regional official said that because of the amount of research which had been done on pinnipeds, we already know virtually all of the information needed for management purposes. He stated that what was needed now was to be able to detect human interactions and epizootics.

An individual who had worked with the Network in Southern California stated that the response rate on dead pinnipeds was "poor." She said that the agency had little interest in pinniped strandings because the population of Zalophus was increasing and information from such strandings was not a priority. She said that in many areas the Network was dependent on receiving reports from lifeguards or waste disposal personnel and that such reports were often not filed (H. Bernard, pers. comm., 1989). The problem is not new. In a letter describing the initial steps to formalize the Networks, it was stated, "A problem exists in that the beach management agencies find a lack of interest or enthusiasm by investigators for common species such as Zalophus californianus" (Letter from William H. Stevenson to John R. Twiss, Jr., October 29, 1981). All along the California coast, Network members stated that sea lion carcasses were picked up by waste disposal agencies and no reports were filed. One of the animal control units near San Francisco said that the NMFS Regional Office had indicated that they were not interested in dead pinnipeds and that they had stopped filing reports. One individual stated, "In reality only cetacean records are complete. NMFS has played down seals and sea lions" (R. Jones, pers. comm., 1989).

The situation is somewhat similar with harbor seals in the northwest. To some extent the telephone logs have served to compensate, but the information is less reliable and certain information cannot be obtained. As an example, accurate information on human interactions is not available. A study conducted on the causes of death along the Oregon coast over a 5-year period indicated that bullet wounds were a significant cause of pinniped mortality (Stroud and Roffe, 1979). Although only anecdotal, several members of the Stranding Network indicated that a relatively high percentage of deaths continue to be gunshot wounds.

It is easy to understand the frustration of Network members in areas where there are large numbers of pinniped strandings. As one individual in southern California put it, "We cannot possibly respond to all pinniped strandings" (J. Heyning, pers. comm., 1989). Another Network member in the state of Washington pointed out that they responded to all strandings during the first couple of years that they were in the Network, but dead harbor seals were just too numerous. Beginning in 1985 and 1986, they made a decision that they could no longer respond to all reports (J. Calambokidis, pers. comm., 1989).

Recognizing the limits as to what can be reasonably expected from some of the researchers and institutions, the agency has an option. It can accept the fact that coverage is not going to be total and that there will be limits to the reliability and utility of data produced. A reasonable guess as to species and location can be made from phone logs, but little of the other Level A data will be collected. Reports of human interactions are likely to be

unreliable unless the person who makes an initial report sees netting around an animal. As an alternative, an effort could be made to expand the Network for such responses to include non-specialists. This is the course which has been followed by the California Network. Such a decision will necessarily entail a more extensive training effort and the preparation of species identification guides and basic information on how to accurately complete stranding reports. If Stranding Network members are relieved of some of the burden, it may be possible to call on their assistance in training people such as lifeguards and animal control units.

The 1987 Stranding Workshop recognized that more needed to be done to maintain adequate baseline data on pinnipeds. The participants recommended:

> "Respond to frequent strandings of pinnipeds, and develop and maintain a centralized data file for pinniped strandings, as is being done for rarer strandings of cetaceans and sirenians. In some regions pinniped strandings occur so frequently that there is little interest and not enough participants to respond consistently. Some workshop participants felt that more volunteers, and funds to provide necessary resources to these volunteers, should be required and sought in these regions" (Reynolds and Odell, in press).

Closely related to this issue is the erosion of enthusiasm (or burnout) of Network participants. Once an individual has covered a number of strandings by a particular species, another event of a similar nature may not be nearly so interesting. The time and financial resources that go into responding to a stranding weigh more heavily. In several areas, Network members noted that the response rate was not as good as it had once been. One individual said that people only would investigate species in which they have an interest. He had compensated for this by expanding the number of people who were available (T. Gornall, pers. comm., 1989). An individual in another region noted that the response rate is not as good as it could be because certain people respond only when and if it is convenient. In such instances, it might be necessary to call several members of the Network before finding someone to cover a stranding (J. Reynolds, pers. comm., 1989). Another individual in the same Network noted that members were responding more slowly to dead strandings and that fewer people were working beyond Level A data (L. Price, pers. comm., 1989).

If such a phenomenon is affecting the response rate in an area, it may be necessary to expand the Stranding Network base. At a minimum, greater recognition and feedback needs to be given to the dedicated individuals who have collected data and information. It may encourage them to keep up their level of effort if they are aware of the importance of the data and how the data are utilized.

Having noted the factors affecting response rates, some general observations are in order. In many areas the rate is close to total. Response rates for live strandings and for dead cetaceans are generally very good, and while it is not possible to quantify mathematically, they have improved since the Networks were formed.

Also potentially affecting the utility of data for establishing baselines is the accuracy of reporting. Dr. James Mead, who has compiled stranding reports in the Smithsonian Institution's Marine Mammal Events Program (MMEP), has had the opportunity to assess the quality of reporting over a period of time. The MMEP compiles Level A data on cetacean strandings. Dr. Mead's assessment is that the quality of reporting has improved over the last 10 years. In the past, species identifications were sometimes questionable and the reporting of sex was highly unreliable. He estimates that better than 80 percent of the data are now reliable. He pointed out that the improvement was, in part, due to the efforts of Network coordinators who would call back to the person filing the report if it was incomplete or there was something questionable on the form. He pointed out that exact

geographic location of the stranding sometimes is not reported, and something as simple as the condition of the animal may not be filled in (J. Mead, pers. comm., 1989).

For the most part, reports submitted by major institutional members are accurate for Level A data, and many of the institutions are working beyond Level A data. In virtually every Region, however, some of the Network members expressed the view that reporting could be improved. Many times, their comments were about the quality of work at Levels B and C. Several individuals commented that the results of necropsies were unreliable. It should be noted, though, that Levels B and C are not mandatory. Some of the Network members expressed the opinion that individuals in the Networks have a responsibility to work beyond Level A and to publish results for the scientific community. Given the inability of the agency to require anything more than Level A data, only such things as providing information on necropsies and peer pressure are likely to produce an improvement.

A number of Network members in each of the Regions expressed concern about even Level A data. One individual said that the data are inconsistent and currently comparisons among Regions are impossible. As an example, he said that in reporting lengths, some individuals are reporting curvilinear lengths and others straight line lengths (S. Sadove, pers. comm., 1989). In most areas, participants were of the opinion that Level A data as reported by trained personnel were generally reliable, but in some areas the Networks are dependent on individuals such as lifeguards, animal control units, and Marine Patrol personnel for filing reports on strandings of common species. One individual also commented that inactive members of the Networks may be less reliable when they do respond.

A number of individuals indicated that even species identification could be inaccurately reported by untrained personnel (D. Odell, pers. comm., 1989, J. Reynolds, pers. comm., 1989, H. Bernard, pers. comm., 1989, J. Lecky, pers. comm., 1989, J. Heyning, pers. comm., 1989, and J. Roletto, pers. comm., 1989). One individual pointed out that in cases where almost everything which strands is considered to be a bottlenose dolphin, opportunities to work with unusual species may be missed (D. Odell, pers. comm., 1989). There was virtual unanimity that a species identification guide would be useful. One person did offer the opinion that a guide would not be as useful as might be assumed for beach personnel responding to pinniped strandings. He said that people such as lifeguards would be unlikely to have their guide with them and that differentiating between species such as California sea lions and Steller sea lions would be beyond the capabilities of untrained personnel even if they did have a guide. The problem of species identification by inexperienced personnel may be complicated by the fact that carcasses are often decomposed affecting coloration or other keys to identification.

NMFS produced very good guides for cetaceans on both the Atlantic and Pacific coasts (Leatherwood et al., 1976 and Leatherwood et al., 1982). There was a limited press run, however, and it became difficult to obtain copies. The Pacific version has now been republished commercially. The U.S. Fish and Wildlife Service put out a guide for beached animals on the west coast which was less detailed in terms of individual species but incorporated pinnipeds and marine birds (Ainley et al., 1980). It is now out of print. In addition to limited availability such guides are not practical because they are too complex. The NMFS Pacific guide has 236 pages. What is needed is something simpler which could be widely distributed. As the coordinator of the Southeast Network put it, "I would like to have hundreds of copies of something that I could give to every Florida Marine Patrol officer" (D. Odell, pers. comm., 1989). Ideally, a species identification guide should be limited to no more than 16 pages, printed on waterproof paper, and incorporate some of the features from the Leatherwood volumes. In addition to visuals, they have a verbal side-by-side comparison of key identifying features of similar species. As an example, to distinguish between Kogia breviceps from Kogia simus, they give tooth counts and the fact

that K. simus has several short irregular creases on the throat while K. breviceps lacks such creases (Leatherwood et al., 1982).

One Network participant suggested that reports be stratified by reliability in order to assist those who work with the data. Data provided by specialists with voucher specimens collected, i.e., photographs or skeletal materials, could be assumed to be highly accurate. A high level of confidence could be placed in reports filed by nonspecialists with voucher specimens collected or in reports filed by specialists without voucher materials. The lowest level of confidence would be for nonspecialists filing reports where there is no means of confirmation (J. Roletto, pers. comm., 1989). Because it is not currently possible to monitor Network members' performance, such stratification is not feasible.

One of the methods in which stranding data could be used for management purposes is by recording human interactions. To date, the data on such interactions have been very uneven. Hare and Mead (1987) have laid out some of the difficulties involved:

> "Accurate monitoring (of human/marine mammal interactions) depends on systematic beach coverage and qualified respondents. Monitoring is currently dependent upon public or institutional interest. This is variable and difficult to measure. Through training, we can have more consistent data collected. Respondents must be able to recognize signs of human interaction and know how to document evidence supporting their interpretations. A well intentioned respondent can mistake bird peck marks for bullet holes or tooth rake marks for net marks unless there are criteria by which to judge trauma and methods to confirm the interpretations made. An effort must be made to determine if trauma occurred before death, and hence was a mortality factor, or after death, presumably in an unrelated incident."

In order to improve reporting on human interactions, a couple of steps would be warranted. First, the agency needs to communicate its interest to Network members more actively. As discussed below, moving such information up to Level A data would assist the agency in both management and enforcement. The Southwest Region already requests such information on its stranding report form. In other Regions, however, such information would only be included if a participant elects to put such information on the line reserved for remarks. The second action which would be warranted would be to provide information and training to Network members. The Northwest Region published a good handbook for the identification of human interactions (Hare and Mead, 1987), but the handbook is already in short supply. If such information is to be prepared for the use of Stranding Network members, there must be a commitment to continue to provide it over a period of time.

In general terms, coverage and reporting are good enough that major impacts on populations can be detected. For the most part, the utilization of stranding data is limited to acting as an indicator. With limited exceptions, the baselines are good enough that epizootics or other mass mortalities can be detected fairly early. Stranding rates of pinnipeds on the California coast were an order of magnitude higher during the El Niño winter of 1982-3 (Seagars and Jozwiak in Reynolds and Odell, in press). Similarly, with data provided by the Stranding Network it was possible to trace the course of the leptospirosis epizootic in 1984 (Seagars et al., 1986 and Dierauf et al., 1985). On the east coast, the efforts of Network members were responsible for determining the cause of mass mortalities in harbor seals in 1980 (Geraci et al., 1982) and 1982-83 (Hinshaw et al., 1984). Increases in the numbers of harbor porpoise strandings in 1983 and 1984 were correlated with increased effort in halibut gill net fisheries in an area in California (Seagars et al., 1986).

Where the response rates for strandings approach total coverage or where there is a consistency in response rates, data from the Stranding Networks may have even greater potential. Stranding records were used to indirectly estimate the impact of the 1987-88 mass mortality of bottlenose dolphins on the population. The process was described in the FEDERAL REGISTER:

> "(P)otential impact of the die-off was estimated by comparing stranding rates reported during the die-off period to the prior 3-year average reported stranding rate. Inherent in this assessment is the assumption that the reported stranding rate is a consistent index of stock mortality rate for the period of analysis.
>
> During the 11 month period from June, 1987 through April, 1988, 742 stranded bottlenose dolphins were reported to the Smithsonian Institution's marine mammal stranding events program. This represents 10.11 times the average annual number of dolphins reported stranded during the previous three years" (FEDERAL REGISTER, October 11, 1989).

To account for possible bias, an alternative method of estimating mortalities was also used:

> "Alternative analysis of the stranding-rate data, stratifying over portions of the coast most densely populated, and for which increased public awareness would have the smallest expected impact on the probability of detecting and reporting strandings, consistently results in estimates of reductions greater than 40% over the 5-10% natural mortality rate range" (Ibid).

RECOMMENDATIONS

1. The agency must decide to what extent it wants total reporting of Level A data on all strandings. There are two options available. First, NMFS can concede that it will be impossible to approach total coverage by specialists and attempt to account for biases in data created by lower unit effort. Second, NMFS can make an effort to have the Networks cover as many strandings as possible, recognizing that the quality of data will not be as good. Although such data as sex and length of the animals will be questionable, and no information beyond Level A data can be obtained, such reports would, at a minimum, give the magnitude of strandings by species, location, and season. If the second option is adopted, NMFS has a responsibility to make the data as reliable as possible. This would entail a commitment to training and the preparation of printed materials such as species identification guides. Guides should be widely distributed and available to people such as beach authorities and marine patrol personnel. Such guides could also provide basic material such as how to record basic measurements.

2. Greater emphasis needs to be placed on verification of data through such things as collection of voucher specimens and photographs.

3. The Regions should identify those areas where there is virtually total coverage so that they can serve as an index for baseline data.

4. There is a serious gap in reporting which needs to be addressed in the Southeast Region. The agency laboratories which are in this area should assist in response. An individual should be hired for a limited period of time with State and local personnel and to find people willing to respond. The individual should work with people to draw attention to the Network and help with responses.

5. A record should be kept of strandings when there is no response or when there is an incomplete report. Such information should be kept in a separate data base which is

readily available to the agency and to researchers interested in determining the magnitude of strandings with some idea of species and location.

6. A national data base should be reestablished for pinnipeds. It is very difficult to reconstruct the numbers of pinnipeds which have stranded. In part, this is due to a perceived attitude that such data are less important than cetacean strandings. Although it is possible to use existing records to detect major events, the records are currently of limited utility and are of little use in detecting human interactions.

7. Reporting of human interactions should be moved up in priority. They should be added to the reporting form and become part of Level A data. Materials to assist respondents in this area, such as the handbook prepared by the Northwest Region, should be widely distributed and maintained in print.

8. A system should be set up by each Network to monitor the quality of reporting. It is recommended that this be a committee of scientists involved in the Network. Such monitoring of data will have two purposes--to ensure that baselines are as accurate as possible and to identify problems which could be addressed by training or reinforcement.

INITIAL RESPONSE

In areas where the Networks are active, procedures to ensure that appropriate people are notified of strandings generally operate well. This is, in large measure, due to the efforts of individual Network members and NMFS regional personnel. Reflecting differences in the Networks and local situations, there are differences in the ways initial reports reach respondents and in the way an initial response is structured. Such flexibility is an integral part of the Networks and is the result of practical experience. Such efforts should be encouraged and the development of national guidelines could inhibit what has been a very creative process.

In areas where the Networks have been active, there has been a systematic effort to raise public awareness and to involve those agencies which are likely to be contacted by those who first observe a stranding. The general public has been alerted to the Network through such activities as distribution of posters in beach areas and the use of media. In 1983, the Cousteau Society commissioned a series of four posters to be distributed in each of the Regions which asked people to report marine mammal strandings and listed a contact number. The artwork was of animals likely to strand in a particular region. Various institutions have taken similar actions in their geographic areas. One institution has even approached realtors who rent vacation units to ask them to include a sheet for vacation homes (J. Roletto, pers. comm., 1989).

With pinniped strandings, there is a different reason for educating the public. Often a well-meaning person will see a seal pup and incorrectly assume that it has been abandoned and try to remove it. In each of the three Regions which have pinnipeds, efforts are made to inform the general public that pups should be left alone. Both NMFS and some of the institutions involved issue press releases just before the pupping season. The cooperation of the media has been good. In addition, leaflets have been distributed in beach areas. In the Northwest Region, the Oregon and Washington Sea Grant programs helped in designing and printing the leaflets.

The next level at which information is important are the authorities to whom the general public is likely to report a stranding. Such individuals are most often law enforcement or beach personnel. They are the most likely contact point with the Network itself, and in some areas, they are responsible for filing some of the reports. It is important that they know where to call and what basic information is needed to trigger a response. Some of the NMFS Regions periodically contact State and local authorities to inform them of the Network operations. In addition, several institutions involved in stranding responses said that they also contact local authorities directly and give them telephone numbers and basic information. Because such people are also likely to be the first on site, they can serve another purpose, i.e., limit access to the site by the public and, if necessary, provide basic first aid for stranded cetaceans. Some Network members indicated that they hold education programs for the local authorities in their areas (G. Patton, pers. comm., 1989; J. Roletto, pers. comm., 1989; and S. Sadove, pers. comm., 1989). In addition to providing basic information, such programs probably increase the interest in strandings generally.

Network members have discovered the importance of contacting local authorities periodically. There is likely to be a fairly rapid turnover of personnel such as lifeguards and park rangers. In the Southwest Region, the NMFS office also makes an effort to contact local authorities if they should hear of a stranding which is not reported. They inform them of the Network and invite both their cooperation and participation.

The procedures for initial contact with the Networks may either be centralized or decentralized depending on the locality. In the Northeast Region, virtually all calls go directly to the letterholders themselves. Because letterholders are responsible for entire states though, the procedure retains the characteristics of a centralized response. In the Southeast, the response is, for the most part, decentralized although a lead organization has been designated in each of the geographic regions in Texas. In the Southwest, the response mechanism is more complicated depending on whether the stranding is of a pinniped or cetacean and whether the animal is alive or dead. Having such a system could be confusing although in most areas there is cooperation among the members, and a report usually gets referred to the appropriate place. Nevertheless, one member of the Network suggested that the response mechanism could be simplified and suggested that there be a single telephone number for each of the six regions in California. Responses would then be channeled to the appropriate institution (J. Heyning, pers. comm., 1989). Finding an institution willing to accept such a role could be a problem in certain areas, however. In the Northwest Region, Primary Response Centers have been designated for specific geographic regions, and all calls are supposed to go through them. They then contact and designate a respondent. Informal arrangements have developed, however, and a good portion of the calls go directly to specific Network members (R. Ferrero, pers. comm., 1989 and R. Osborne, pers. comm., 1989).

Although there is no clear preference and the best procedure is the one that works, there should be a note of caution. It is more difficult to monitor response rates for a decentralized response mechanism than for a centralized one. If there is an option of contacting one of several members, it is more difficult to detect problems when they occur. In those areas where the response is decentralized, the agency will have to expend more effort to ensure that basic data are obtained from all strandings.

Many of the institutional participants have made arrangements so that they are on call 24 hours a day. In some instances this is accomplished by providing personnel to respond to telephone calls at all times. Such individuals may not themselves respond to strandings themselves, but they can contact animal care personnel. The New England Aquarium has set up a system so that a call received on their stranding line is transmitted to a beeper carried by one of their staff (G. Early, pers. comm., 1989). A beeper arrangement to contact personnel is also used by Mote Marine Laboratory (G. Patton, pers. comm., 1989) and other institutions. Some of the participants have tape machines which are checked periodically for calls.

There have been mixed results with the use of an 800 telephone line. In Florida, it was tried and later abandoned. The Whale Museum has found it useful in Washington (R. Osborne, pers. comm., 1989).

When a call is received, a certain amount of basic information is needed for a response. Accuracy and completeness of such information depends on the individual making the call being able to give an accurate description and on the individual receiving the call being able to gain the maximum amount of information. As indicated above, many of the initial contacts are made by government authorities. An effort to provide them with information in advance, e.g., some training or a species identification guide, can enhance the accuracy of information that they provide to Network respondents. Depending on the type of institution responding, there are several ways necessary information is obtained. When the respondent is either an individual or part of a smaller institution, the person answering the telephone is likely to be able to ask the appropriate questions. In other cases, an institution will have trained personnel return a call to the original source. Finally, some institutions have established protocols to enable the respondent to gain the necessary information (California Marine Mammal Center, 1986).

There is certain information that participants have determined is important. As obvious as it may seem, the name and phone number of the person making a call is important. For any number of reasons it may be necessary to get back to a person. The species of animal is important for the type of response. In the case of cetaceans, the first obvious breakdown is between whales and smaller animals. The presence or absence of baleen and throat grooves can help at least make a differentiation between large odontocetes and mysticetes. The presence or absence of a dorsal fin and the shape of the head may further differentiate whales. It is more difficult for an untrained observer to identify smaller cetaceans. For pinnipeds it is often possible to determine if they have external ears, and to get descriptions of the method of locomotion and pigmentation patterns, e.g., the color and/or presence of spots. Even if an individual is only able to differentiate phocidae from otariidae, it may help the respondent. Virtually everyone agrees that estimates of length and weight are extremely unreliable.

The condition of the animal also should be ascertained. The most important determination is whether the animal is alive or dead. An immediate response is required for a live cetacean.

It is important that the exact location is obtained with clear directions on how to get there. Information on physical landmarks in the area such as buildings, roads, inlets, radio towers, etc., are also useful. Accessibility to the site is also important if an animal has to be moved for either rehabilitation or disposal of a carcass.

The Network coordinator in the Northeast characterized the timeliness of responses as "good to excellent" (T. McKenzie, pers. comm., 1989). In general terms, the same thing could be said about specific types of strandings in other areas where the Network is active. In the case of live stranded cetaceans a rapid response is critical. J. Mead gave his impression that the combination of faster response times and better first aid measures on site have reduced the number of cetaceans dying from heat prostration over the last decade (J. Mead, pers. comm., 1989). There seems to be a consensus that responses to live cetacean strandings are generally rapid.

There is another reason to respond rapidly to strandings of dead animals. There is pressure for local officials to remove decomposed carcasses as soon as possible, sometimes before important scientific information has been obtained. As an example, a right whale carcass was buried in a landfill last year before scientists had the opportunity to examine it and collect samples. Without consistent and timely responses to strandings of dead animals, it is not reasonable to assume that local authorities will be cooperative. This issue has been resolved in the Northwest Region. Both the States of Washington and Oregon have established formal time limits before carcasses are removed. In the case of Oregon, researchers must respond within 16 hours of the initial report (Letter from the Oregon Department of Transportation, Parks and Recreation Division to Northwest Regional Office, National Marine Fisheries Service, October 1, 1984). The deadline for the State of Washington is 5:00 p.m. the following day (Washington State Parks and Recreation Commission Directive 83-4, revised July 9, 1987).

In the case of live pinnipeds, there is a different time element. Calls may come in reporting animals on the beach which are not stranded. In the Northwest Region, there is a formal policy to leave such animals alone for 24-48 hours unless they are being harassed by humans or animals. While less formal in other Regions, there is often a similar policy. In portions of California, an exception is made for animals on busy beaches.

Through trial and error, active Network participants have also determined what equipment is necessary for a response. Lists of equipment run from the very practical, i.e., warm clothing with changes, to materials needed to collect scientific samples, e.g., formalin solution, sampling jars, and whirl packs. For the most part the distribution of such lists

has been limited to the individuals actually affiliated with a particular member. There are, however, a number of places where such lists can be obtained. One paper presented to the 1977 Stranding Workshop contained such a list (C. Skinder and J.Mead in J. Geraci and D. St. Aubin, 1979). In the Southeast Region a handbook has been distributed to Network members which contains an equipment list [Anon. n.d. First Aid and Rescue of Stranded Marine Mammals (in the Southeastern United States)]. A similar list has been prepared for the volunteer network set up on Cape Cod to deal with mass strandings (D. Morast, pers. comm., 1989).

Formal preparation of such a list (and basic information on how to respond) in each region would be helpful for new Network members and for non-specialists who file reports. Active members of the Networks have, for the most part, worked out their own lists.

Some equipment is not commonly available to an average Network member. Perhaps the most obvious is heavy equipment for loading and transporting large carcasses. In many areas, participants have identified sources of such equipment and have informal arrangements for its utilization. Local governments, the Coast Guard, the Navy, and private companies have all provided assistance in various places. If possible, locating such equipment in advance of strandings is advisable. Other equipment such as flensing knives may not be routinely available. Flensing knives were purchased and distributed to Network participants in the Northwest. The Southeast regional coordinator pointed out that there was other equipment which could serve several members of the Network which individuals might not necessarily possess. As an example, he pointed out that some locations cannot be served by large institutions and regional freezer units would be useful for the preservation of tissues from significant strandings (D. Odell, pers. comm., 1989). Without assurances as to the quality of such tissues including techniques of collection, records of life history data, and standardized curation maintenance of such freezer units may not be productive. Network coordinators should have close enough contact with the Networks that they can identify such needs, and there should be a channel to identify and meet such needs.

Early in the operation of the Networks there were questions as to who had authority at the site of a stranding. For the most part, that issue has been resolved even in areas where there are multiple letterholders. Several of the Regions have further defined responsibilities if a mass stranding should occur.

Many of the member institutions utilizing volunteers have training programs. Depending on how volunteers are utilized, the level of training varies. Volunteers used to expand coverage to remote geographic areas may be trained in species identification, basic first aid for live stranded animals, and collecting the basic data for a stranding report. In other instances, they receive training handling live strandings of pinnipeds and animal care during rehabilitation. Some institutions have expanded training programs to include enforcement and beach management personnel who may receive initial reports.

Some institutions do not engage in extensive training of volunteers. As an example, the New England Aquarium uses volunteers only under the close supervision of highly trained personnel from the Aquarium itself (G. Early, pers. comm., 1989). The purpose of the training program for the Cape Cod mass stranding program is basically to acquaint people with the situations they may face and to make sure that they follow instructions. The assumption is that even relatively untrained personnel can be useful if they operate under close supervision. Similarly, the head of one of the Primary Response Centers in the Northwest indicated that the best way to train somebody is to take them along on a number of strandings before they attempt to do anything on their own (T. Gornall, pers. comm., 1989).

A number of people who respond to strandings do not have access to such training, however. In some areas, the Network is dependent on non-specialists or individuals with an insufficient background for obtaining basic information. For such individuals, training provided at annual meetings would be valuable. At a meeting of Southeast Network participants in 1989, the Network coordinator went over what was required for accurate Level A data. The author observed, however, that the majority of attendees were active Network participants and that those who most needed the help were not likely to be in attendance. In Texas, a similar meeting was held, basic protocols discussed, and a dissection of a dolphin was conducted and taped so that it could be used as a teaching or training tool.

One of the papers presented at the 1977 Stranding Workshop contains the basics of a stranding response protocol (C. Skinder and J. Mead in J. Geraci and D. St. Aubin, 1979). Since then various institutions have developed protocols on an as needed basis. Some are detailed, e.g., California Marine Mammal Center's protocol for rescuing live animals. Others are less so, e.g., the Northwest Region's mass stranding protocol. Still others have no written response protocols because the individuals responding have extensive experience. However, even some institutions which have years of experience, e.g., Sea World, San Diego, have prepared response protocols (J. Antrim, pers. comm., 1989). General response protocols for live cetaceans have been distributed in some areas [Anon. n.d. First Aid and Rescue of Stranded Marine Mammals (in the Southeastern U.S.) and International Fund for Animal Welfare, n.d.].

In several areas, protocols have been developed for handling mass strandings. The Northwest Network has developed a basic protocol designating specific members for tasks and identifying data needs. A more detailed plan has been developed to deal with mass strandings on Cape Cod. Although mass strandings are not common in California, the Network coordinator has met with Network members in some areas to develop a contingency plan. In some areas, groups have adapted portions of the detailed mass stranding protocols developed in Australia and New Zealand (M. Rodriguez, pers. comm., 1989 and D. Morast, pers. comm., 1989) (Anon. 1984. Victorian Whale Rescue Plan... and Anon. 1987. Marine Mammals Stranding Seminar: Seminar Handbook).

Although some have suggested that the development of a general response protocol would be helpful (D. Odell, pers. comm., 1989), others have observed that people have developed their own methods over the years and generally do a better job by using methods with which they are comfortable. Requiring adherence to a strict protocol may actually inhibit the gathering of information (J. Mead, pers. comm., 1989). The two views are not necessarily contradictory. The second was referring to people who have extensive experience while the first realized that some responses are made by people such as Marine patrol officers and other inexperienced people. To the extent that inexperienced people may respond to strandings, Regions may want to prepare basic response guidelines.

The protocols which do exist are primarily focused on live strandings and first aid for stranded marine mammals. Much less is available on how to record information from dead stranded animals. Such things as the proper method for taking measurements and how to determine the sex of an animal are not widely distributed. It is assumed that anyone making a report should already know such information. In some areas, not enough emphasis has been placed on the collection of voucher materials and even very basic information such as what portions of an animal to photograph and making sure that a scale is included in photographs. Similarly, little has been prepared for Network use on the collection and curation of tissues for Level B analysis, e.g., stomach contents and reproductive tracts. Because of concern over data collection and curation of samples, a paper was prepared for the 1987 Stranding Workshop in Miami dealing with such procedures (J. Heyning in Reynolds and Odell, in press). It is recommended that this paper

be widely distributed among Network members. There still is a need, however, to instruct some people in how to identify and collect tissues.

It should be noted that the Stranding Network in Texas has undertaken the preparation of a handbook which will include everything from species identification to the collection of voucher materials to methods of collecting tissues. Although it has not reached fruition, the product could be useful as a model for other Networks.

Several people have noted that it would be useful to have a series of videotapes which could be used in training (D. Odell pers. comm., 1989, R. Tarpley, pers. comm., 1989, T. Gornall, pers. comm., 1989, and J. Mead, pers. comm., 1989). The most basic videotape would correspond to a response protocol for live strandings and the collection of Level A data. With the encouragement of the Marine Mammal Commission, a training videotape focusing on cetaceans is currently being developed. Using videotapes for education and training at other levels also has been suggested. Videotapes could be used to help Network members identify organs and to provide information on how to collect tissues. Finally, several individuals said that the preparation of both a necropsy guide and videotape would increase both the quantity and quality of data.

There is likely to be press coverage of any stranding involving a very large marine mammal, a live cetacean, or a mass stranding. The press can be either a problem or it can help raise public awareness of marine mammals and the activities of the Stranding Networks. There are sensitive issues, e.g., if it should be necessary to euthanize an animal. Those involved with the Network should be aware of the possibility and some basic guidelines for dealing with the press should be available. Several of the participating organizations have people whose sole responsibility is to work with the media at the site of a stranding and have prepared basic information sheets. In order to reduce the chaos which ensues when there is a mass stranding, it has been suggested that a single dead animal be moved and that it be used to brief observers on what may be gained in terms of scientific information, thereby reducing interference from casual observers.

Media attention can be an opportunity to educate, and individuals should not be hesitant to take the time to explain why particular measures are taken and what information can be gained and how it can add to the general body of knowledge. Such things as the use of teeth to determine age and what the age structure can tell us about the status of a population are not commonly known and can be of interest to a general reader.

Some strandings are more significant than others. Important scientific information can be obtained from strandings of rare or endangered species. One individual suggested that contingency plans need to be in place so that such strandings are covered quickly by experts. He suggested that a system needs to be in place to immediately contact species experts, to identify tissues which should be saved, and to identify resources which would help in a response (H. Neuhauser, pers. comm., 1989). The first draft of a right whale recovery plan emphasized the importance of gaining information from stranded individuals and made suggestions for contingency planning.

The second area in which contingency planning would be useful is for mass strandings. To a greater or lesser degree such contingency plans are in place in most of those areas which experience mass strandings. A detailed plan has been prepared for Cape Cod, but there have been no mass strandings since it was developed. In the Southeast Region, arrangements are more informal, but responses have been discussed among the members of the Network. The Northwest Region has a very basic protocol included in its Network directory.

LIVE STRANDINGS

Over the years the response mechanism which has been developed for stranded pinnipeds has proven to be quite effective. Because pinnipeds normally spend time out of the water, speed in responding is not critical as it is in the case of cetaceans. With education, the number of unnecessary responses has also dropped.

In most areas, the response to live stranded cetaceans has improved both in terms of timeliness and in terms of the initial level of first aid. There is an awareness that animals should be kept upright with holes dug under pectoral fins and that protection from hyperthermia, dehydration, and exposure to sunlight is important. Some of this information seems to have been communicated to the public at large, but there is not necessarily an understanding that it may not be the most humane action to try to return an animal to the sea. One member of the Northeast Network indicated that he is receiving more reports of attempts to put animals back into the water (G. Early, pers. comm., 1989). If this is perceived to be a problem in an area, an education effort may be necessary similar to that for pinniped pups. It should be noted that singly stranded animals are most often in bad physical shape and that the best action is to notify someone so that an animal can receive care or be euthanized.

In most Regions, provisions have been made to contact aquarium or rehabilitation personnel when there is a live stranding. Several institutions have indicated that they do a basic triage operation when they get to a site (G. Patton, pers. comm., 1989 and S. Sadove, pers. comm., 1989). A number of guidelines have been used in various areas to determine if an animal is terminal. The Northwest Stranding Network in its directory states that if an animal has been exposed to sunlight for more than six hours, it should be considered terminal. The New Zealand stranding protocol indicates that if an animal is bleeding from the mouth, blowhole, or anus it is a sign of severe internal injury, and such an animal should be euthanized (Anon., 1987). It should be noted, however, that bleeding from the anus may be an unreliable indicator because the feces of one of the more commonly stranded species, Kogia breviceps, have a reddish tinge [Leatherwood et al., 1982 and Anon. n.d., First Aid and Rescue of Stranded Marine Mammals (in the Southeastern U.S.)].

Beyond the initial stabilization involving keeping a cetacean cool, administering fluids for dehydration, and shielding an animal from the sun, several institutions have gone to a secondary phase of determining health by analyzing blood chemistry. Some tests are conducted on site. In other instances blood samples are taken to an aquarium's lab or to a local hospital for analysis. In many instances local hospitals run the tests at no cost to Network members. In at least one instance, however, a Network member indicated that while the local hospital would run tests, he had to pay for them (M. Rodriguez, pers. comm., 1989).

Based on analysis of the mass stranding of sperm whales in Oregon in 1979, the Northwest Network directory suggests that an elevated white blood cell count can be an indication that an animal is suffering from heat prostration. Although it does not specifically mention it, it is probably an indication of dehydration. There are a number of other blood parameters which have been suggested to determine pathological problems. Tests on serum glucose can be run on site relatively easily, and some institutions have injected glucose solutions when there were indications of hypoglycemia. Similarly, at least one facility indicated that it administers calcium injections if an animal goes into convulsions. They indicated that convulsions were an indication of hypocalcemia. (G. Patton, pers. comm., 1989).

There are indications that cetaceans are very susceptible to stress and shock (Colgrove, 1978, Stuntz and Shay, 1979, Thomson and Geraci, 1986, and St. Aubin and Geraci, 1988). Efforts to understand the physiology of stress and shock in stranded cetaceans are

relatively recent. There are a number of blood parameters which are examined by Network members to detect stress and/or shock. The interaction between various chemical changes and treatment responses are less clear. Thomson and Geraci (1986) indicated that a decrease in the number of circulating eosinophils can be a consistent indicator of stress in dolphins. It has also been demonstrated that thyroid hormone levels are suppressed by stress in belugas (St. Aubin and Geraci, 1988). One of the authors of the study suggested that the measurement of adrenocortical and thyroid hormone levels in the blood may be beneficial as indicators of stress in stranding situations (Geraci, pers. comm., 1989).

In the Southeast Network, some individuals routinely conduct electrolyte analysis (D. Odell, pers. comm., 1989 and G. Patton, pers. comm., 1989). Imbalances among sodium, chloride, and potassium are used as indicators that an animal may be stressed. The same results could also be an indication of dehydration (Walsh et al., 1989)--a condition which often occurs in stranding situations. As indicated above, some Network members assume that dehydration is a problem with live stranded cetaceans and routinely administer fluids. When asked, the individuals did not know to what extent such treatment may also compensate for stress and shock. It has been suggested that the administration of electrolytes could also be used as treatment for stress (G. Patton, pers. comm. 1989).

Blood gases and pH levels also can provide indicators of an animal's general condition. Cetaceans can go into shock rapidly with vascular collapse and pooling of the blood resulting in a failure to get oxygen to the extremities. Levels of blood gases can indicate whether oxygen reserves are sufficient. Acidosis can also indicate an animal in shock (J. Geraci, pers. comm., 1989)

Among some of those responding to live strandings, steroid therapy is routinely instituted early in the treatment process. It has been suggested that steroids be administered cautiously as there may be side effects. Although discussing captive animals, Schroeder (1987) noted that application of steroids could increase the susceptibility of a stressed animal to bacterial infection and recommended against the prophylactic use of steroids. Although the results are preliminary and require confirmation, Myrick (1988) raised another issue in this area in research conducted on dolphins kill in the eastern tropical Pacific tuna purse seine fishery. He suggested that stress results in hypocalcemia and that the reduction of serum calcium levels may be precipitated by an increase in serum steroid levels. If confirmed, it might be possible that routine administration of steroids could exacerbate one of the conditions associated with stress.

The second question is whether hypocalcemia and stress may be related to the behavior of animals following a stranding. Myrick (1988) observed that tetany might be caused by hypocalcemia. For years rafting behavior has been observed in dolphins surrounded by purse seines and it has been assumed that such behavior may be related to stress (Stuntz and Shay, 1979). One writer observed similar behavior in a case where he suspected that transportation-related stress may have occurred (Colgrove, 1978). Although limited to anecdotal evidence, a number of people have observed that when stranded animals are brought to a facility for treatment, they often have difficulty swimming. Similarly, those who advocate restoration to the ocean at the site of a stranding have observed that animals are often stiff and measures need to be taken to treat such a condition (Robson, 1984 and Anon., 1984, Victorian whale rescue plan).

Although stress and shock are conditions which contribute to the mortalities of live stranded cetaceans, there is uncertainty as to the physiology and chemical interactions of such conditions even among the most experienced members of the Stranding Networks. Additional research and a pooling of knowledge in this area could reduce the high mortality rate for stranded cetaceans. A better understanding of the processes involved could also help in the development of a treatment protocol.

RECOMMENDATIONS

1. Where it is not already the case, Networks should regularize the process of periodically contacting local law enforcement agencies and those agencies with jurisdiction over beach areas to gain their cooperation in reporting strandings. Such contacts should provide basic information such as a description of the Networks, the reasons information from stranded animals is important, and a phone number(s) listing the appropriate Network contacts.

2. The Regions should provide basic information such as response protocols, lists of equipment needed and how to record Level A data to Network participants. Some participants do not need such information, but it may help others. Such information could be adapted from materials already developed by some Network members for their own use.

3. The paper prepared by John Heyning for the 1987 Stranding Workshop containing information on standards for data collection and curation should be distributed to all Network members.

4. A videotape demonstrating basic response and data collection protocols should be prepared. Such a videotape could be distributed for use in the training of Network members. Thought should be given to the preparation of a videotape on basic tissue collection and how to collect Level B data. Similarly, a videotape on necropsy techniques would be useful both in training Network participants and for general education purposes.

5. Contingency plans should be developed for responding to particularly significant stranding events.

6. As is discussed below, a professional workshop dealing with treatment techniques for live stranded animals would be useful in sharing information. One or more sessions could be devoted to on-site emergency stabilization measures for live stranded cetaceans including the physiology of stress and potential treatment protocols.

EUTHANASIA

The humane destruction of stranded marine mammals that are suffering and unlikely to be saved by available measures often can be a sensitive and controversial issue. If handled carelessly, it can compromise public support for the Stranding Networks.

The regulations passed to implement the Animal Welfare Act provide a definition of euthanasia:

> "'Euthanasia' means the humane destruction of an animal accomplished by a method which produces instantaneous unconsciousness and immediate death without visible evidence of pain or distress, or a method that utilizes anesthesia produced by an agent which cause (sic) painless loss of consciousness, and death following such loss of consciousness" [9 C.F.R. § 1.1(ll)].

Because of the logistics of responses and the fact that such strandings are usually easily managed, euthanasia of pinnipeds is not really an issue. In most instances, pinnipeds are transported to a facility for treatment. A euthanasia decision is made after tests have been conducted, and an animal is euthanized in accordance with the facility's established protocol. Such facilities normally have veterinary personnel, and administration of euthanasia is done by them or under their supervision.

Conditions are much different with some cetacean strandings. First, an assessment of an animal's condition may have to be made more rapidly if treatment is to be successful. Second, in the case of a large mass stranding or large whales, transportation to a treatment facility generally is not a viable option. To further complicate the situation, such strandings are more likely to attract media attention. Reporters may be uninformed and assume that animals only need to be returned to the ocean. Euthanasia followed by an effort to collect tissues could be portrayed as callousness. To avoid negative publicity, some members of the Networks will not euthanize an animal if the public or press are observing a rescue operation. There are a number of accounts of large whales taking two or three days to die. Certainly such a course is not the most humane option. Some Network members indicated that they sometimes chose the option of benign neglect on the assumption that if no measures are taken, a suffering animal would die more rapidly than if it received first aid measures.

Even when a Network member has made a determination that euthanasia is the appropriate course of action, there have been instances when NMFS enforcement personnel have questioned the decision (S. Sadove, pers. comm., 1989 and R. Tarpley, pers. comm., 1989). Barring unusual circumstances, NMFS should be in the position of supporting Network members if controversy develops following a reasonable action by a responsible and knowledgeable person.

Such problems did not go unnoticed by the 1977 Stranding Workshop. Included in its recommendations was a paragraph on euthanasia which discussed the issue. "Not to (euthanize an animal) either through public pressure or fear of legal repercussions is cruel to the animal, a potential threat to public health, and the focus for public nuisance" (Geraci and St. Aubin, 1979).

The issue of euthanasia has clearly troubled some Network participants who have witnessed the suffering of animals as they have died lingering deaths. One individual emphasized that it was important that it be addressed in the program review. He went on

to state that it needs to be more clearly accepted as a viable option in stranding situations (S. Sadove, pers. comm., 1989). Having been on the scene of a mass stranding of sperm whales in Oregon, one individual argued for quick euthanasia in some circumstances. He listed three reasons: it is humane to the animal; in some mass strandings it may prevent other animals from coming ashore; and soft tissues which have scientific value may be destroyed before an animal dies. He concluded with the wry observation, "Now we need some bright people to contribute ideas on how whales can be killed humanely!" (Mate, 1985).

There seems to be a consensus that only qualified people should make the decision to euthanize an animal and take the necessary measures, but there are differences in who has such authority among the Regions. The Meibohm memorandum (Appendix C), which is often cited as the basic policy document for the Stranding Networks, addressed euthanasia. It stated:

> "A living marine mammal may be:
>
> 1. Humanely euthanized, at the direction of the competent local, State or Federal officials, and under veterinary supervision; and then disposed of as would be a dead stranded animal..." (Memorandum from Winfred H. Meibohm to NMFS Regional Directors, July 5, 1977).

When the Networks were set up, however, it was apparently realized that such a system would prove to be unwieldy. Government officials would not be present at every stranding, nor would a veterinarian necessarily be on site. The regions generally took a more pragmatic approach.

In the Northeast, Letters of Authorization do not address euthanasia. The Network coordinator, however, stated that letterholders and their cooperating veterinarians are authorized to euthanize animals. As indicated above, there are relatively few members of the Northeast Network, and they possess expertise in working with marine mammals. One member of the Network suggested that one of the criteria for Network membership might very well be the qualification of an individual to administer euthanasia (S. Sadove, pers. comm. 1989). The Northeast Region of NMFS is in the process of revising Letters of Authorization, and it might be advisable to clarify the authority to euthanize animals in the Letters.

In both the Southwest and Southeast, the authority to euthanize is contained in the general conditions accompanying all Letters of Authorization. The only requirement is that the individual notify the NMFS Regional Director within seven days of the death and the reason for euthanasia. In practical terms the Southwest Letters are self-limiting since a participant is only authorized to respond to particular types of strandings. A euthanasia provision is superfluous for an individual who is only authorized to respond to strandings of dead animals.

In the Southeast, the situation is somewhat different because letterholders may respond to all types of strandings. With relatively open membership, there are clearly some Network members who are not qualified to euthanize animals. A couple of Network members have indicated that they are not qualified, and one openly expressed concern that such authority was not more carefully restricted (H. Neuhauser, pers. comm., 1990). If the criteria for Network membership remain unchanged, it may be necessary to restrict euthanasia authority to specifically designated individuals.

The Northwest Region does not issue Letters of Authorization. The only reference to euthanasia in the Network directory is in the context of the mass stranding protocol which was developed in 1982. There is an implicit assumption that participants are authorized, and the participants themselves feel that they have such authority. The protocol states that

if the animals cannot be restored to the water at the subsequent high tide, consideration of techniques to euthanize animals should be given immediate attention. The protocol then indicates that a memorandum will be circulated by Tag Gornall on how to euthanize a whale. Such a memorandum was never prepared. Dr. Gornall indicated that he was not totally comfortable with widely distributing such a guide but that he is willing to respond to telephone inquiries if a Network participant needs advice on how to euthanize a stranded animal (T. Gornall, pers. comm., 1989).

After the Exxon Valdez oil spill, the NMFS Alaska Region granted the Alaska Department of Fish and Game explicit, if somewhat circumscribed, authority to perform euthanasia on marine mammals. The letter provided:

> "1. Euthanasia must be performed in a humane manner.
> 2. Only animals judged by a licensed veterinarian or a trained marine mammal specialist to be near death and beyond recovery or rehabilitation should be euthanized.
> 3. Euthanasia should not be performed under circumstances which may be observed by people who are not trained biologists.
> 4. Euthanasia should not be performed on any species of the genera Eschrichtius, Megaptera, Balaena, Balaenoptera, Physeter, Ziphius, Mesoplodon, Delphinapterus, or Orcinus without prior coordination with this office" (Letter from Steven Pennoyer to Lloyd Lowry, April 11, 1989).

None of the Networks provides a protocol discussing when euthanasia is appropriate or the methods. There is also some disagreement as to the necessity for such a protocol. One individual in the Northeast strongly advocated setting up established procedures (S. Sadove, pers. comm., 1989). In a paper presented to the 1987 Stranding Workshop, Hofman offered a series of questions to be addressed in order to assess the effectiveness of the Stranding Networks. One question concerned the existence of protocols, and a protocol on euthanasia was among those listed as necessary (Hofman in Reynolds and Odell, in press). The Network coordinator in the Northeast pointed out that development of a protocol would be difficult because each stranding has a different set of variables. She stated that, at some point, it is necessary to rely on the judgment of those who are on the scene. She suggested that the development of guidelines instead of an explicit protocol would provide flexibility (T. McKenzie, pers. comm., 1989). One individual who had participated in meetings when participants attempted to address the issue stated that developing an acceptable protocol would probably be difficult (J. Mead, pers. comm., 1989).

The preceding chapter lists some of the conditions that various people have listed as terminal, e.g., high core temperature, long periods of exposure without first aid, or evidence of internal injury. Perhaps two other conditions should be added as situations which warrant humane destruction: massive external injury and situations when lack of resources prevent either transportation for treatment or restoration to the ocean.

As difficult as it may be to establish a protocol for when to euthanize a marine mammal, it may be even more difficult to develop a protocol for methods under field conditions. The APHIS regulations on care of marine mammals states that a program of euthanasia shall be established and maintained under an attending veterinarian [9 C.F.R. § 3.110(a)]. There are no standards, however, for evaluating such a program. It is assumed that as long as a facility meets the standards of the American Veterinary Medical Association (AVMA), it satisfies the provisions of the regulation. The AVMA has not established standards for the euthanasia of marine mammals, however. Its Panel on Euthanasia examined methods of euthanasia generally, but their findings did not mention marine mammals and only had limited applicability in field conditions (Smith et al., 1986a). Euthanasia of stranded cetaceans was, however, discussed at length during the 1983 Stranding Workshop sponsored

by the Royal Society for the Prevention of Cruelty to Animals (RSPCA) in the United Kingdom (RSPCA, 1985).

Perhaps reflecting the greater sensitivity of the issue in the United States, foreign stranding guides are more likely to contain protocols for euthanasia than those issued in the United States. There is a similarity in the methods proposed. They all discuss shooting through the brain as one technique (Anon., 1984, Victorian whale rescue plan; Anon., 1987, Marine Mammals Stranding Seminar; RSPCA, 1985; RSPCA, 1988; and Universities Federation for Animal Welfare, 1988). Similarly, virtually all discuss intravenous injection of a euthanizing agent (Ibid.). There is less of a consensus on exsanguination as a method. The use of explosives is discussed in a couple of places, but with the exception of the New Zealand plan is almost uniformly rejected because of safety considerations. Each of the methods has disadvantages, and each becomes complicated if the stranded animal is a large cetacean.

In some instances, discussions of the use of firearms become very involved in ballistics. Such things as muzzle velocity and caliber of projectiles become important considerations. Uniformly it is pointed out that shooting is not an appropriate method for large cetaceans because of limited chances of success. The most commonly described technique for small cetaceans is a shot through the blowhole at a 45°angle down and toward the back of the animal to a point between the pectorals. The second suggestion is a shot aimed slightly up from the midpoint between the eye and ear. There is a serious safety problem associated with the use of firearms, though. Guns can be dangerous to both the individual using them and to onlookers. It is possible that the projectile could be deflected by bone and kill or injure people in the area.

Intravenous injection of euthanizing chemicals has been suggested in several places. Among the chemicals suggested have been etorphine hydrochloride (Immobilon), ketamine, and sodium pentabarbital. Injecting a struggling animal under field conditions could be hazardous to the person administering the chemical. One individual suggested that there could be a danger of accidental injection of Immobilon (RSPCA, 1985). The Victorian whale rescue plan generally discourages the use of such methods. "It is considered that forms of parenteral euthanasia, in particular the intravenous use of barbiturates, morphine derivatives and potent neuro-leptanalgesics may constitute a considerable safety risk to the operator" (Anon., 1984). It should be noted that injection in the flukes of an animal should also be discouraged. Obviously, chemicals used for euthanasia can be dangerous and should only be handled by those who are competent to do so. In most instances, such drugs are only available to licensed veterinarians.

In the case of large cetaceans, the dosages of chemicals needed to euthanize an animal can make effective administration impossible and/or prohibitively expensive. The New Zealand handbook estimates that it would take 20,000 mls. of sodium pentabarbital to euthanize a mature male sperm whale (Anon., 1987). The quantities of the drugs involved may be unmanageable. Tag Gornall has indicated that it may be possible to euthanize large whales with a relatively small quantity of potassium chloride if it is injected at the base of the eye (T. Gornall, pers. comm., 1989).

The use of large amounts of euthanizing chemicals may also create a disposal problem. Although the RSPCA stranding guide lists etorphine hydrochloride as the preferred method of euthanasia, it also contained a warning that the carcass should be protected from scavengers (RSPCA, 1988). If euthanizing chemicals have been used and a whale is buried, it is possible that the chemicals could leach into intertidal areas (Mate, 1985).

Several of the Stranding Network members expressed a preference for exsanguination as the most humane method of dispatching large whales. The two methods which have received attention are use of a lance to puncture the heart (RSPCA, 1985, Robson, 1978,

and S. Sadove, pers. comm., 1989) and severing major blood vessels such as the carotid artery or the brachial vein. Such a technique requires that the individual possess expertise in cetacean anatomy before it is attempted. It should be noted that some of the guides indicate that it is their opinion that such a method is not the most humane method and should be used only if other methods are not available (RSPCA, 1985 and Anon., 1987, Marine Mammals Stranding Seminar). There is an additional problem with exsanguination--it is likely to be viewed as gruesome by untrained onlookers.

One problem raised by Network members has been media coverage and the possibility that such coverage might be negative. As one individual put it, "A decision to euthanize includes a need to communicate" (W. Rossiter, pers. comm., 1989). The Network coordinator in the Northeast said that experience has shown that if an effort is made to brief people in advance of such an action, the public will be supportive (T. McKenzie, pers. comm., 1989). Even though it will not always appear in print, it is useful to explain the reason for such a decision. Network members should not hesitate to discuss basic physiology and the condition of an animal. At worst, onlookers and the public will understand that such a decision was not made without careful consideration. At best, there may be an opportunity to get beyond the basic "A whale washed up on shore yesterday, attracted a lot of attention, and eventually had to be put down" story.

RECOMMENDATIONS

1. Letters of Authorization should include explicit language on euthanasia. The agency should return to the basic format of the Meibohm memorandum and limit the authority to veterinarians and marine mammal specialists or people under their direct supervision. Not only is such a limitation likely to be more humane to the marine mammals, but it is also likely to minimize the safety hazards associated with euthanasia.

2. There are a range of options available in terms of generals for when to euthanize a stranded cetacean and appropriate methods:

> (a) Assuming that authority is limited to competent people, do not change existing procedures. The individuals who are likely to have to make such decisions have experience and field conditions make virtually every stranding different. At some point, NMFS should depend on the judgment of Stranding Network members with professional expertise.
>
> (b) Develop general guidelines as to when euthanasia is appropriate and methods which are humane and minimize safety threats. If such an option is selected, it is recommended that such guidelines be developed by those who have experience with stranding situations and that the input of animal welfare/humane organizations be actively solicited. Often much of the criticism from such organizations is the product of an exclusionary process. The euthanasia panel of the American Veterinary Medical Association should also be represented.
>
> (c) Develop actual protocols for euthanasia. If such an option is selected, a process similar to option 2 should be initiated. Such an option may have a couple of disadvantages. First, there may not be sufficient flexibility. Stranding situations do not take place under ideal conditions and the resources available may vary, affecting both whether an animal can be rescued and how humane destruction may be accomplished. Second, the development and distribution of a protocol may encourage untrained personnel to attempt euthanasia on the assumption that it provides a step-by-step procedure as to how it can be accomplished.

The preferred option is either option (a) or a combination of options (a) and (b).

ON THE SPOT RESCUE

There has been some disagreement among Stranding Network members as to the ethics and efficacy of returning live stranded cetaceans to the sea. The dichotomy is reflected in the steps taken to rescue animals in different parts of the country.

Some Network members contend that such efforts are usually futile and not humane. They point out that medical assessments indicate that stranded animals are unhealthy and that there is ample evidence that such animals have a propensity to restrand (Caldwell et al., 1970; Fehring and Wells, 1976; Mead et al., 1980; Odell et al., 1980; and Odell, 1989). The proponents of this position advocate that those animals which are not terminal be taken to facilities which can treat them.

While acknowledging that many animals should not be returned to the ocean, other Network members have expressed the view that with critical selection criteria, there can be success. They make use of the protocols adopted in New Zealand and Australia (Anon., Victorian Whale Rescue Plan, 1984 and Anon., Marine Mammals Stranding Seminar, 1987). While admitting that the evidence is far from conclusive, they point out that there is anecdotal evidence that if the proper steps are taken, animals may be restored to the sea successfully.

There are circumstances where it may be possible to minimize the divergence. Some strandings are caused by unusual weather or tide conditions, and the animals which strand may be relatively healthy if there is an expeditious response and pathological changes such as hyperthermia, dehydration, and shock have been avoided. There are a number of records of cetaceans which were apparently stranded on sandbars or were stranded by tides in which the animals were subsequently freed and swam off (RSPCA, 1985). Sergeant recorded three live stranded Stenella coeruleoalba on Sable Island, Canada, which were able to free themselves (Sergeant in Geraci and St. Aubin, 1979). A Network member reports that a fin whale, Balaenoptera physalus, stranded on a sandbar in the Seven Mile Channel in the Florida Keys because of a tidal event, and Network members were able to release it (M. Rodriguez, pers. comm., 1989). In the same general area in 1983, 15-20 spotted dolphins were trapped on a sandbar north of Key West, and volunteers helped them off the sandbar (E. Gardner, pers. comm., 1989). Confirmation of survival in these cases is not available. In New Zealand in 1982, twenty one bottlenose dolphins, Tursiops truncatus, were trapped in a tidal inlet and stranded when the tide went out. They were lifted by helicopter back to the water. The animals were observed for two days and appeared to behave normally (Robson, 1984). In October 1988, a pod of beluga whales, Delphinapterus leucas, was apparently stranded by falling tides in Cook Inlet, Alaska. Actions were taken to keep them cool and wet, and they freed themselves at the next high tide. No restrandings were observed in the area (S. Zimmerman, pers. comm., 1990).

Excluding individuals which may have been stranded by unusual tidal or weather conditions, it is probably not a humane action to try to restore single stranded cetaceans to the sea. Experience has shown that such animals tend to be injured, diseased, or highly parasitized. Generally, the prognosis for the survival of such animals is poor, even if they are taken to a facility for rehabilitation. At a minimum, if a stranded animal is taken to such a facility, it can receive treatment, and information on basic physiology, pathology, and treatment may be gained.

In the case of mass strandings, there are two general approaches. In each, first aid is administered and basic triage decisions are made. In some areas it is policy that animals which are not terminal should be transported to facilities for treatment. Obviously such an approach is influenced by the propinquity of adequate facilities. Extensive regions of the coast do not have such accommodations nearby, and cases where scores of animals are involved are beyond the capacity of any facility. It should be recognized, therefore, that such an approach will limit the number of animals that can be saved.

The second approach is to attempt to refloat the animals. Elaborate protocols were developed in New Zealand and Australia (Anon., Marine Mammals Stranding Seminar, 1987 and Anon., Victorian Whale Rescue Plan, 1984) which have been adopted by portions of the Stranding Networks. The protocols provide a series of steps for returning mass stranded animals to the sea. After discussing basic first aid, they deal with how to get an animal to the water, warning that dragging an animal could injure it further. They then suggest that two people rock the animal in shallow water until its equilibrium is restored and stiffness in the muscles has been worked out. After the animals have recovered, they suggest the formation of core groups in deeper water. There are suggestions for towing the animals to deeper water. At least one of the suggested methods--towing an animal by its tail--may injure an animal further.

The Cape Cod Stranding Network, which operates as a sub-designee under the New England Aquarium's Letter of Authority, has incorporated these protocols into its planning for mass strandings. They have purchased equipment such as dolphin stretchers and made arrangements for a holding area in a sheltered cove near Wellfleet (D. Morast, pers. comm., 1989 and C. Mayo, pers. comm., 1989). To date, there has been no opportunity to test the plan which they have developed.

Similarly, a basic protocol has been established to deal with mass strandings in the Florida Keys. Because of their experience with open water pens, the Dolphin Research Center has also considered an approach that is intermediate between transporting animals to treatment facilities and releasing them on the spot, i.e., constructing temporary holding pens at the site of a stranding.

Each of the Regions approaches mass strandings differently. Because there are few mass strandings on the west coast, they have not been given as high a priority as other operations of the Network. In California, they have designated individuals to be on site coordinators for such strandings in specific coastal areas. Where possible, the inclination seems to be to take cetaceans in for treatment. It should be noted, though, that such a conclusion is based on the methodology for individual strandings. There is one instance where animals were restored on site. In January 1989, a female Grampus griseus and her calf were stranded alive at Hermosa Beach, California. They were placed in shallow water awaiting the arrival of personnel who would transport the animals to an aquarium. The animals appeared to recover, startled those in the water with them, and swam off on their own (J. Cordaro, pers. comm., 1989).

The Northwest developed a mass stranding protocol in 1982. It indirectly states that refloating of animals is the preferred option by stating that if animals cannot be returned to the water by the next high tide, euthanasia should be considered. It should be noted that there are relatively few facilities in Washington or Oregon which could rehabilitate more than individual animals. In 1989, the Point Defiance Zoo and Aquarium did rehabilitate a stranded neonatal Phocoena until it could be weaned. The Network has never had occasion to test the procedures developed since 1982.

As pointed out above, a Network has been established to deal with mass strandings on Cape Cod. There have been no mass strandings on Cape Cod since the formation of the plan. In at least two instances, animals from mass strandings were rehabilitated to the point where

they could be reintroduced to the wild. In 1983, Mystic Marinelife Aquarium recovered three live stranded Lagenorhynchus acutus. Two of the animals died while being treated. The third was released after 126 days. It was tagged with a spaghetti tag, and there was an unconfirmed sighting of the animal a month later (Buck et al., 1988). In 1986, three pilot whales, Globicephala melaena, from a mass stranding were taken to the New England Aquarium. All three were released the following June. One animal was radio tagged and one animal had a satellite tag. From the latter, scientists confirmed survival for at least three months and obtained information on the movement of the animals, the length of time between dives, and the depth of dives (Mate, 1989 and Early and Rumage, 1988).

Although the stranding guide distributed in the Southeast does discuss procedures for returning cetaceans to the sea (Anon., First Aid and Rescue of Stranded Marine Mammals, n.d.), as a result of some unfortunate experiences with restrandings, the preferred option is to take animals in for treatment. Some members of the Network in Florida stated that not returning animals to the water on site was an official policy of the Network. The NMFS Regional person who works with the Network stated that no formal policy exists, however (J. Brown pers. comm. 1989). At least one Tursiops truncatus was taken in for rehabilitation and later restored to the wild (White and Francis-Floyd, 1988). In two recent mass strandings, one of Pseudorca crassidens and one of Globicephala macrorhynchus, an effort was made to run blood tests to determine the health of the animals. The tests indicated that the animals had severe health problems (Odell et al., 1989). The coordinator of the Southeast Network has emphasized that live animals should receive a medical examination before an attempt is made to return them to the water. In a poster presentation at the 1988 Conference of the American Cetacean Society, he wrote:

> "A standard, objective examination of all mass stranded cetaceans will provide the basis for determining which animals are healthy and which are not, and for providing the most humane treatment. Animals simply cannot be pushed back into the sea and total success claimed because the animals aren't seen again" (D. Odell, Poster presentation Third Biennial Conference of the American Cetacean Society, Monterey, California, November 11-13, 1988).

The final point has been one of the shortcomings of efforts which have been made to return animals to the sea. There is little verifiable evidence that such animals have survived. This was acknowledged in the Victorian Whale Rescue Plan. "Virtually nothing is known of post-stranding behavior and no objective data are available on the long-term survival of animals returned to the sea" (Anon., 1984). A member of the Northeast Network also expressed concern in this area. He said, "Efforts need to be conducted in a verifiable manner. Such efforts should be tempered with a rational assessment of success and risks" (S. Sadove, pers. comm. 1989).

There have been very few instances where even short-term survival of an animal restored to the water at the site of a stranding is confirmed. Aerial surveillance has been conducted in Australia to make sure that animals did not immediately restrand (Whiteside, 1989). However, experience in Florida has shown that such animals may restrand several days after having been returned to the ocean (Fehring and Wells, 1976 and Odell et al., 1980). There is at least one report of long-term survival. James Mead reported that he was aware of a sei whale, Balaenoptera borealis, for which there was a confirmed sighting eight months after it had been restored to the water (RSPCA, 1985). There have been at least two instances in the northeast where animals were returned to the sea and subsequently resighted. A harbor porpoise was freeze branded, returned to the sea and later resighted (T. McKenzie, pers. comm. 1989). Three pilot whales were rescued on Cape Cod in 1986. The animals were tagged before they were released and one of the animals was resighted behaving in a normal manner with other animals two weeks later (C. Mayo, pers. comm., 1989).

Tagging

There will always be an element of doubt as to the survival of animals returned to the water at the site of a stranding unless there can be verification of the success of the technique. A representative of one of the letterholders in the Northeast Region discussed this:

> "The appropriateness or 'success' of a response can only be verified by post stranding monitoring of released or retained animals. Ideally, survival as well as state of health could be determined" (G. Early, pers. comm., 1989).

In their discussion of the release of live stranded animals, Hare and Mead (1987) stated, "If possible, the animal should...be tagged or marked before release."

If the issue of whether stranded cetaceans should be returned to the water is to be resolved, then a means of verification must be developed. At a minimum, such animals should be tagged or photographed so that there will be a record if they restrand. Photographs can be used as voucher specimens for stranding reports if they are taken in a proper manner.

Virtually every protocol for returning stranded animals to the sea strongly advocates that the animals be tagged. The Victorian Whale Rescue Plan recommends either a disc tag or spaghetti tag affixed to the dorsal fin (Anon., 1984). As a short term means of confirmation if an animal should restrand, the New Zealand protocol suggests tying a piece of cotton ribbon around the tail stock of an animal which is returned to the sea (Anon., 1987). It should be noted, however, that such a method runs the risk of cutting off circulation. In addition to the use of disc tags, the workshop sponsored by the RSPCA discussed the use of cryogenic branding. The workshop discussed the relative merits of various types of tags pointing out that some had a relatively limited lifespan. It was observed, however, that such tags would serve the purpose of identifying an animal during the relatively short period when rescuers are on the alert for restrandings (RSPCA, 1985). Another individual suggested that if no tags were available that it might be possible to notch the trailing edge of the dorsal fin of an animal (E. Gardner, pers. comm., 1989).

All such methods would be useful in providing information if an animal should subsequently restrand. They will not allow an absolute determination of survival. Only if an animal is resighted at sea can verification of success be made, and the chances of resighting an animal which may have a range of several hundred miles are minimal. As indicated above, however, there have been at least two instances where such efforts were successful.

There are techniques, however, which can increase the probability of verifying the success of a rescue effort. Both radio tags and satellite tags have been used to track cetaceans. If such techniques could be used on animals returned to the sea, some of the questions as to the survival of such animals might be resolved. Without such an effort, NMFS is in the position of authorizing an activity which may be questionable and may not be the most humane method of dealing with stranded animals.

There are major differences in the policies on tagging animals among the Regions. In general terms, there is uncertainty as to the authority to tag animals at the site of a stranding. There is less of a problem in dealing with the tagging of animals which have been rehabilitated and are being reintroduced to the wild. For the most part such animals are pinnipeds. There are major differences, however, even in whether tagging is mandated after an animal has been rehabilitated.

The Northwest Region requires rehabilitated animals to be tagged and the tag number and information on the animal's condition to be submitted to the Regional office within 15

days after release. Although the guide contains a sketchy protocol for mass strandings which discusses the release of animals at the site, it does not mention tagging of animals. Because there have been few occasions where animals could be released, tagging of animals has not been an issue.

The Southwest Region requires the tagging of rehabilitated animals in its Letters of Authority. Beginning in 1983 the Region provided tags for rehabilitated pinnipeds. Until 1985 the tags were orange Temple cattle ear tags. Since 1985, they have been orange Dalton Rotoriese tags. The Region has also set up a data base to record resightings of tagged animals. A degree of uncertainty exists as to whether there is authorization to tag animals which are released on site. The stranding of two Grampus griseus in January 1989 generated a question from the Region as to whether authority to tag such animals exists (Memorandum from E.C. Fullerton to Nancy Foster, January 26, 1989).

The policy in the Southeast Region differs from the other Regions. The Network coordinator indicated that authority to tag animals does not exist. He said that the original Letters of Authorization included the authority to tag, but it was removed after a legal opinion was issued in the Regional office (D. Odell, pers. comm., 1989). Several other members of the Network expressed the view that authorization for tagging does not exist. The Regional Office was unable to locate a written opinion, however. Although there have been fewer instances of rehabilitated animals being restored to the wild than in other Regions, the prohibition apparently extends to rehabilitated animals. Because the definition of "take" in the regulations includes tagging, there is a reticence to approve activities involving tagging without a scientific research permit. It should be noted, however, that the general authority of members to participate in Stranding Networks is already an exemption from the "take" provisions. The provisions contained in Sections 109(h) and 112(c) of the MMPA may also be applied to the release of animals. Tagging can help determine if such actions are consistent with the welfare of the animal. Since such measures are management actions, evidence as to their effectiveness becomes an essential element of an effective program.

In the Northeast, the Letters of Authority contain a provision requiring that rehabilitated animals be tagged before release. It is further assumed that letterholders have the authority to tag animals for on site releases.

There is virtual unanimity that stranded animals should be tagged whenever it is feasible. Those who express such a position include researchers and scientists, representatives of environmental groups, and NMFS resource managers. The issue of whether stranded cetaceans should be returned to the water will not be resolved satisfactorily unless there is an active effort to encourage the tagging of animals that are released.

RECOMMENDATIONS

1. Efforts should be made to encourage research on the medical and physiological status of stranded marine mammals. Animals should not be returned to the water if they are unlikely to survive. Information on tests which could be run to determine the health of a stranded animal should be compiled and shared among Network members so that triage decisions are made on the best available information.

2. NMFS should issue a policy statement that, whenever feasible, stranded animals returned to the water should be tagged. It should also be a condition of all Letters of Authorization that all rehabilitated animals be tagged before release. Implicit in such a requirement is the responsibility to instruct those who need training in the proper application of tags. Tag numbers and related information should be reported to the NMFS Regional office so that there is a record of resightings.

3. NMFS should fund a project to either satellite or radio tag cetaceans returned to the ocean. One of the specialists in satellite research has indicated that a fitted satellite tag could be prepared on site (B. Mate, pers. comm., 1989). Such tags could verify the survival of released animals. As an added benefit, such tags could also generate information on animal behavior. The release by the New England Aquarium of a rehabilitated pilot whale carrying a satellite tag generated information on the long-term movement and depth and timing of dives by a free-ranging animal (Mate, 1989). It is recommended that such a project be targeted on the Cape Cod area of Massachusetts because it is the area which has set up a protocol for returning animals to the ocean. Initially, tags should be attached to those animals which medical examinations show are most likely to survive.

4. The Regional Offices should maintain a data base on animals tagged and any resightings as a means of determining the effectiveness of release actions. Other Regions may want to adopt the example of the Southwest Region and provide the tags to those who are releasing the animals.

DISPOSAL

One issue which continues to be troublesome for Network members is the disposal of carcasses of dead marine mammals. While sometimes humorous, problems with disposal, especially of large whales or mass strandings of cetaceans, have occasionally inhibited researchers who wanted to work with significant species. One individual told of a blue whale which stranded on the west coast. Local officials told researchers that if they touched the carcass, they would have to dispose of it. The impasse continued for a couple of days before the issue was resolved. When researchers finally gained access to the carcass it had deteriorated and was of little use (R. Hofman, pers. comm., 1989). Despite an effort to address the issue of disposal in the Northwest Region, disposal of large cetaceans can be a problem except on state owned land. One researcher indicated that there is a reluctance to get involved in strandings on private property because of disposal problems. He stated that researchers do collect Level A data, but they may not attempt to cut into an animal (R. Ferrero, pers. comm., 1989).

Some members of the Stranding Networks have had to bear the cost burden of disposal, and at least one individual indicated that such a cost might compromise his ability to remain in the Network. In this area, the Networks reflect some of the other problems facing our society. Solid waste disposal is a serious problem in some areas, and in those areas disposal of carcasses from stranded animals mirrors the difficulties of local jurisdictions. As an example, the Florida Keys have a problem with capacity for landfills, and it is difficult to get them to accept carcasses. The Network member in the area was unable to find a landfill which would accept the carcass of a sperm whale calf. Another time, they had to pay $1,000 apiece for the disposal of three pilot whales (M. Rodriguez, pers. comm., 1989). An individual in California expressed the same frustration:

> "In recent years it has become common that we are told at the scene of a stranding, 'If you take anything, you have to take it all.' This means that disposal of the large specimens has gotten to be a major problem, costing several hundreds to thousands of dollars" (R. Jones, pers. comm., 1989).

Even those who are willing to take responsibility for disposal have had difficulty finding a facility which will accept a carcass. One facility indicated that they normally take carcasses to a rendering plant, but the plant was not always willing to provide the service (J. Roletto, pers. comm., 1989).

Most of the Networks do not have guidelines for disposal, but as the Network coordinator for the Northeast Region pointed out, there is a certain logic in not issuing guidelines. She commented that methods of disposal will vary depending on the number of animals, their size, the accessibility of the site, and the availability of resources. She commented, "Typically you go with whatever method is available for free" (T. McKenzie, pers. comm., 1989).

In one area, however, specific methods of disposal have been formalized. A directive issued by the State of Washington lists possible options:

> "Allow natural processes to proceed in place without intervention. This is usually the case for small mammals, or ones located in remote areas.
>
> Move the body to a location that significantly reduces the hazard it presents to public health or welfare.

Bury the body in the beach above the normal high tide line.

Take body to landfill or transfer station.

Arrange to have the body rendered on site. Discuss with NMFS.

Make arrangements and possibly transport the body off-site for rendering. Discuss with NMFS." (Washington State Parks and Recreation Commission, Directive 83-4, July 9, 1987).

A number of different methods have been used to dispose of dead stranded marine mammals. To some extent each is dependent on the conditions of a stranding and each has some limitations.

The most extensively employed method is transport to a sanitary landfill. This is most effective with small cetacean or pinniped carcasses and is often the preferred method when sanitary workers pick up the carcasses. In some places, there is a problem because of the shortage of landfill capacity. The use of landfills becomes more difficult for mass strandings or very large cetaceans. Transportation of large cetaceans also may be a problem. In two Regions there is an implicit preference for this method of disposal. Letters of Authorization in both the Southeast and Southwest grant authority to take and transport dead marine mammals for "disposal at a sanitary landfill or other location determined to be suitable on a case-by-case basis by the Regional Director, SER."

Because of the difficulties of transporting large carcasses, two other methods of disposal have often been used--towing the animal out to sea and burial on the beach. Both methods have potential shortcomings, however.

The Coast Guard has often cooperated in towing of carcasses back out to sea. Such animals, however, can pose hazards to navigation unless they are towed well out of shipping lanes. In some areas, the prevailing currents are such that unless an animal is towed several miles out, the carcass may restrand. An individual on the east coast stated that they bury large carcasses that would otherwise have to be towed more than 50 miles (S. Sadove, pers. comm., 1989).

Burial on site has been used with both small and large carcasses. In the case of large animals it is probably the least costly option. Those who have used this method have a number of suggestions as a result of their experiences. First, permission must be gained from the upland property owner or, if on public land, from governmental authorities. It is important to be aware of any laws or regulations which might prohibit such a means of disposal. As an example, there were problems when a gray whale was buried at Gray's Harbor, Washington, in violation of a statute protecting dune areas. If possible, such animals should be buried above the high tide line. It has been recommended that the carcasses be buried at least six feet deep and that the body cavity be opened to let gases escape.

Individuals in some areas have taken carcasses to either commercial incinerators or to rendering plants. It should be noted in the latter case that it is illegal to sell the carcass.

Carcasses also have been destroyed by burning or the use of explosives. Neither method is recommended, however.

Although the issuance of guidelines is not necessarily appropriate, there are issues of which Network members should be aware. One of the purposes of disposal is to ensure that nobody illegally gains possession of parts which are prohibited under either the MMPA or

the Endangered Species Act. The method employed should give reasonable assurance that such a situation does not develop.

There are also potential safety hazards involved in dealing with such animals. As is the case with any rotting carcass, potentially harmful pathogens may be present and reasonable hygienic measures should be taken. Large cetaceans tend to bloat with gases and can explode. Care should be taken when lancing such animals. Whether an animal is transported or disposed of at the site, the body cavity should be opened to let gases escape in such a manner that it will not endanger the individual involved.

It is the unwritten policy of NMFS that responsibility for disposal of stranded animals lies with State or local authorities. Such an interpretation is justified in light of the legislative background. Primary responsibility for public health and welfare traditionally has been with state and local governments. Responsibility for disposal of animal carcasses with pathogenic potential is almost exclusively a function of state and local governments. There is nothing in the MMPA that would transfer that responsibility in the case of marine mammals. Although the initial version of the MMPA preempted most state authority over marine mammals, an exception was provided in section 109 that allowed state and local authorities to continue their traditional role. It provided authority to "take" marine mammals for the "public health and welfare." A change to section 109 during the 1981 reauthorization provided the legal foundation for the Stranding Networks. It extended the existing authority to others specifically authorized by the Secretary. There was no indication, though, that primary responsibility for public health and welfare was being altered.

There is also a pragmatic reason for the NMFS policy. State and local governments are better equipped to respond. They are more likely to have equipment for moving carcasses and to operate landfills. NMFS also does not have the financial resources to assume the costs of disposing of more than a thousand marine mammals each year.

Under the NMFS policy, Network members are not required to provide for the disposal of animals, but they are encouraged to assist State or local agencies with jurisdiction. Only in the Northwest has such an arrangement been formalized. The Parks and Recreation Division of the Oregon Department of Transportation has assumed responsibility for disposal within its State. Disposal operations begin if no researcher has contacted them within a 16-hour period. A directive from the Washington State Parks and Recreation Commission explicitly states that the Stranding Network "is not a disposal entity." The State assumes responsibility for disposing of any carcass on State Park beaches. Again, Network participants have a time period during which they must respond. As noted above, however, there still can be problems when an animal strands on private property in Washington.

Many local government units have been ready to accommodate researchers and provide the resources for disposal. In a large portion of these areas, an effort has been made to contact local jurisdictions in advance. If some sort of arrangement has been worked out in advance, cooperation between involved parties is enhanced, and disputes are less likely at the time of a stranding. The Southwest Region has made an effort to systematically contact such local units of government periodically and follows up when problems occur. In other areas, a process of negotiation seems inevitable, and local jurisdictions often attempt to have the researcher or some other unit of government take responsibility for disposal. In some areas Network members have taken it upon themselves to dispose of carcasses. This has contributed to a cost burden for those who have volunteered to respond to strandings (J. Geraci, pers. comm., 1989). By voluntarily taking total responsibility for stranding events, cooperation from local governments is likely to be enhanced and Network members are more likely to receive reports expeditiously.

Several people have suggested that problems can be minimized if an active effort is made to talk with local officials before working with a carcass. By telling them that the Network worker will help them resolve a difficult problem, a cooperative spirit can develop (J. Mead, pers. comm., 1989 and S. Sadove, pers. comm., 1989). Often the combination of public interest and the efforts of both local jurisdictions and Network members have resulted in creative solutions. At various times local businesses have donated equipment such as cranes and trucks. Various entities have also donated labor ranging from the Marines to longshoremen.

Responsibility for disposing of carcasses after tissues are taken is a little more nebulous. In some areas, Network members feel a responsibility to dispose of any animal they cut up. As one individual put it, "If I muck with it, I have responsibility for cleaning it up" (S. Sadove, pers. comm., 1989). In some areas, Network members work an animals after they have been taken to a landfill. At a minimum, Network members should not make clean up and disposal more difficult for local authorities without providing assistance.

If a carcass is transported to a laboratory for additional research work or if a live animal is transported for rehabilitation and subsequently dies, it has been assumed that the Network member has responsibility for disposal. Most of the participants have made arrangements for disposal from their own facilities. Disposing of either large numbers of animals or large animals can still present a problem in terms of finding a site to accept the carcasses or in terms of the cost involved.

RECOMMENDATIONS

There is no magic prescription for addressing problems involved with the disposal of dead stranded marine mammals. One of the roots of the problem lies in a more general societal problem, i.e., solid waste management. Because facilities for handling such materials are local, it is not recommended that NMFS or the Federal government assume responsibility for disposal. Because of widely varying stranding conditions, it is also not appropriate to set up a protocol for disposal. There are a number of measures which should be taken, however.

1. The agency does have some responsibility to those individuals who have volunteered their time and resources to respond to marine mammal strandings. Network members should be informed of the potential health and safety risks involved in handling dead marine mammals and provided with information to minimize such risks.

2. To facilitate cooperation with State and local governments, NMFS Regional personnel should take steps to systematically contact State and local governments with jurisdiction over beach areas. Such an action could be in the context of general information about the Stranding Networks. By attempting to address the issue in advance, friction at the scene may be alleviated. When problems do arise, NMFS personnel should follow up and attempt to prevent their recurrence.

3. Letters of Authorization should contain an authorization to dispose of animals, but the authorization should be worded so that disposal is not mandatory. The Letters should contain language indicating that Network participants have a responsibility to assist state and local governments in the disposal of carcasses, however.

4. Responsibility for disposal of carcasses which are taken for research or for live animals which subsequently die should remain with the Network participant. If a Network participant experiences problems, however, NMFS personnel should be willing to help find a solution.

REHABILITATION

GENERAL

The records of live stranded marine mammals that have gone to facilities for rehabilitation are far from complete as are the records of their final disposition. There are a number of reasons why NMFS' records cannot accurately account for rehabilitation activities.

While the Marine Mammal Inventory (MMI) of captive animals has a field entitled "Take Type" which includes a category "beached/stranded," it is only accurate for animals which have gone into permanent captivity under a public display permit or a Letter of Agreement. Although some facilities record stranded marine mammals on their inventory, others have made it a policy not to report such animals unless they formally enter a permanently captive status. There is a fear that if such animals are listed on the MMI, groups calculating mortality rates of captive animals will not take account of the fact that stranded animals fall into a high risk category.

There is a second problem with using the MMI to trace rehabilitation efforts. If an animal is subsequently transferred, the "Take Type" is changed from "beached/stranded" to "exchange or transfer from another facility." There is, therefore, no way of tracing the initial status of some animals without examining every public display permit and Letter of Agreement. Even then, not every Letter of Agreement necessarily mentions how an animal was initially taken. Therefore, the one area where records are most accurate, i.e., animals entering into permanent captivity, is a minimum figure.

The use of the MMI and Letters of Agreement cannot provide an accurate picture of recovery rates or animals released back into the wild. Because these records contain information on marine mammals which are publicly displayed, they do not necessarily contain information on animals which never reach such a stage. Some institutions do report some information on stranded animals. There are some mortality records of cetaceans which never recovered. There are, however, almost no mortality records for stranded pinnipeds. There are also some records of animals being restored to the wild, but there are inconsistencies. Some institutions report releases, others do not. Even those institutions which have recorded releases have not recorded all releases. As an example, the MMI for the New England Aquarium records the release of 23 harbor seals (Phoca vitulina) and 2 gray seals (Halichoerus grypus) during the period 1977-88. The Aquarium's records show that 39 harbor seals and 6 gray seals were released.

Another problem with using the records of captive display animals is that on both coasts there are facilities which are involved in the rehabilitation of marine mammals which are not public display facilities. Substantial numbers of pinnipeds have been treated by such facilities, and hundreds have been released after treatment. Records from such facilities are not contained in the MMI.

A second source of information on rehabilitation is the stranding records themselves. As indicated above, however, it is difficult to reconstruct stranding records for pinnipeds. The situation is complicated by the fact that two NMFS Regional Offices do not directly receive stranding reports, and there are no formal means of monitoring the status of animals in rehabilitation. A NMFS employee in one region indicated that members of the Stranding Network are normally good about telephoning and reporting live strandings. It is not incumbent on the members to do so, however, and a change in the NMFS person responsible for Network operations can result in the loss of all such information.

One Network has made a systematic effort to maintain records on the final disposition of animals undergoing rehabilitation. The Southwest Region has prepared a computer data base from which both mortality data and the number of animals released can be drawn. The vast majority of live stranded animals on the California coast have been pinnipeds. As an example of the information available, during the 5-year period from 1982 through 1986, 1,898 live pinnipeds were taken in for rehabilitation in California by members of the Stranding Network. Of those animals, 1325 either died or were euthanized, 537 were released after rehabilitation, and 36 went into permanent captivity. The mortality rates are higher during the 2 years when anomalous events occurred, i.e., the El Niño phenomenon and the leptospirosis epizootic. Each of the rehabilitation centers indicates that, due to an increase in scientific knowledge and better animal husbandry, recovery rates are now over 50 percent. As a measure of progress, during the administrative hearing in 1973 it was assumed that recovery rates would not exceed 20 percent.

The combination of the Marine Mammal Inventory and Letters of Agreement does provide a relatively accurate record of animals which have assumed the status of permanent captivity. The records show that since the passage of the MMPA, 14 cetaceans and 431 pinnipeds have survived more than 1 year in captivity. The period of 1 year was selected because many animals never recover after they are taken into facilities and may die even after several months. Table 3 shows the animals by species. The pinniped figures illustrate one of the real successes of the Networks. Since 1977, with one exception, no permits have been issued to take harbor seals or California sea lions from the wild for public display. Rehabilitated animals have served as a pool to provide animals for public display.

As of the end of 1989, facilities were holding five formerly stranded cetaceans that are not reflected in the records. One of these was a neonatal harbor porpoise which stranded in July and had not reached the point where a decision on permanent captivity would be made. Two other animals are listed on the MMI for which no final determination as to releasability has been made. One of these animals has now been in captivity for 12 years without a determination, although the facility did make an effort to regularize its status over a decade ago.

There are at least three other stranded cetaceans which lived for more than a year and are not recorded. Two Grampus griseus stranded in Florida prior to the passage of the MMPA. One lived 2 years and 8 months and the other 3 years and 7 months. One juvenile Pseudorca crassidens stranded in 1986 and lived for 18 months. One of the Stranding Network members used this animal as an example of why public display facilities are hesitant to have stranded animals recorded on the MMI. Although the animal survived for a year and a half, it never returned to normal (D. Odell, pers. comm., 1989).

TABLE 3

RECORDS OF BEACHED/STRANDED ANIMALS IN CAPTIVITY MORE THAN 1 YEAR IN THE MARINE MAMMAL INVENTORY OR RECORDED IN LETTERS OF AGREEMENT (BY SPECIES)

Species	Number
Delphinus delphis	2
Globicephala melaena	1
Grampus griseus	1
Lagenorhynchus obliquidens	2
Orcinus orca	1
Phocoena phocoena	2
Stenella attenuata	1
Steno bredanensis	1
Tursiops truncatus	3
Cetacean totals	14
Callorhinus ursinus	2
Cystophora cristata	6
Halichoerus grypus	2
Mirounga angustirostris	21
Phoca vitulina	173
Zalophus californianus	227
Pinniped totals	431

POLICY

Both the MMPA and the agency's formal policies as expressed in both regulations and the Meibohm memorandum place some constraints on the ultimate disposition of rehabilitated marine mammals.

While § 109(h)(1) of the MMPA allows animals to be removed for their protection or welfare, § 109(h)(3) adds a limitation:

> "In any case in which it is feasible to return to its natural habitat a marine mammal taken or imported under circumstances described in this subsection, steps to achieve that result shall be taken."

A similar provision is contained in 50 C.F.R. 216.22(a)(3). It allows live stranded animals to be removed if such taking:

> "Includes steps designed to insure return of such mammal if not killed in the course of such taking, to its natural habitat. ...Where the marine mammal in question is injured or sick, it shall be permissible to place it in temporary captivity until such time as it is able to be returned to its natural habitat."

The Meibohm memorandum (Appendix D) was specifically designed to address the disposition of live stranded marine mammals. It addresses who may take an animal into captivity for rehabilitation. It provides that following successful rehabilitation a determination should be made regarding the desirability of returning an animal to the wild and implicitly acknowledges that such a course of action is not always the best. The decision is to be made "on the basis of the best available veterinary medical advice." In practice, the decision has been based on the recommendation of the facility's attending veterinarian, on the assumption that he or she has the most detailed information on the condition of an individual animal. If an animal is to be returned to the wild, the memorandum provides that the animal be placed in the vicinity of other marine mammals of the same species. The memorandum also provided for the permanent placement of rehabilitated marine mammals into the custody of a facility with a valid public display permit or into the custody of any other competent non-permitted facility. The placement would be at the discretion of the NMFS Regional Director in the Region where the animal stranded.

The practice of using rehabilitated animals as a substitute for taking from the wild was prescribed in 1981 in the application instructions prepared for applicants for public display permits. In actual practice these instructions apply only to pinnipeds because the number of cetaceans which are successfully rehabilitated is so small. Although logical, this more informal policy would seem to contradict the provisions in 50 C.F.R. 216.22(a)(3) which only provide for the "temporary" maintenance of stranded animals. The instructions to applicants read:

> "NMFS encourages the use of healthy beached/stranded animals in place of taking animals from the wild. In the case of U.S. coastal pinnipeds, such as California sea lions, applicants are required to justify the need for taking animals from the wild rather than obtaining rehabilitated beached/stranded ones. For information on the availability of these animals, contact the appropriate NMFS Regional Office. U.S. facilities may obtain beached/stranded animals under a Letter of Agreement with the Regional Director and do not need a permit."

In two respects there has been an informal change in the last sentence. Permits are now required for rehabilitated cetaceans, and a facility which has not received a marine

mammal permit in the past is required to go through the permitting process when it obtains its first animal.

The requirements for reporting and disposition of live stranded animals vary among the Regions. The Southeast Region requires nothing beyond the initial stranding report, and there are no formal procedures for monitoring the status of animals being rehabilitated. It is the only Region that currently has animals which have been in captivity for more than 1 year without a determination made as to their ultimate disposition. Two cetaceans have been in indeterminate status for over 3 years and a third for 12 years.

The Northeast Region also relies on stranding reports for information on animals taken in for rehabilitation. All letterholders are required to provide a yearly update on their activities, and the Network coordinator said that she periodically checks on the status of animals which are being treated. Letters of Authorization provide that the decision as to whether an animal is to be released is to be made by the Assistant Administrator or a designee such as the Regional Director. The Letters also mandate that animals returned to the wild be tagged, although Network members have been told that a permit for scientific research is needed if either satellite or radio tags are to be used.

In 1986, the Northwest Region issued guidelines for handling live stranded marine mammals. The facility is required to submit a report to the NMFS Regional Office within 15 days of the receipt of an animal. Animals being rehabilitated may not be placed with animals on public display nor are they to be kept in areas that are accessible to the general public. The Network coordinator pointed that they do not want animals to become tolerant of human presence because such animals might be more likely to interact with fisheries (B. Norberg, pers. comm. 1989). All stranded animals are to be released back to the wild within 60 days unless an alternative arrangement is made with the Regional Office. Finally, there is a requirement that all released animals be tagged.

The Southwest Region also requires that an additional form be filed by any facility treating a stranded marine mammal. The Region also requires that any change in the status of the animal such as a death, a transfer to another facility, or a release be reported. The determination as to whether an animal is to be released is to be made by a licensed veterinarian. Tagging of released animals is mandatory, and tags are provided by the Regional Office.

Two observers noted that, in general terms, NMFS made almost no effort to monitor the status of animals while they were undergoing rehabilitation (E. Gardner, pers. comm., 1989 and S. Sadove, pers. comm., 1989). Such an observation should not be surprising because those NMFS employees working with the Stranding Networks have other responsibilities which carry an immediacy that monitoring does not and because established procedures have not been set up to deal expeditiously with such situations.

REHABILITATION PROCEDURES

In each of the Regions, the decision as to whether a stranded animal should be brought in for treatment is left to the Network participant who is responding. No protocols for making such a determination have been prepared. Because each stranding may differ and Stranding Network members are, for the most part, specialists, it is probably appropriate for them to make the judgment call. In most areas there is no evidence that animals which might have been rehabilitated have been left on the beach. To the contrary, animals for which there is a poor prognosis for recovery are often taken into facilities. In addition to

concern for such animals, Network members recognize that such animals can contribute to the general body of scientific information even if they should die.

The exception to this tendency is with pinnipeds in the Northwest Region. As the Network coordinator put it, "The Region does not promote rehabilitation." He pointed out that there are more animals than can be handled reasonably by facilities with capacity for treatment of animals (B. Norberg, pers. comm., 1989). A Network participant stated that rehabilitation is somewhat controversial in the Northwest because of fisheries interactions with marine mammals (R. Osborne, pers. comm., 1989). A couple of people in the Region expressed the opinion that stranded animals are unhealthy and that intervention would be interfering with natural processes. There is, however, an effort to treat animals if the initial problem was caused by human interaction. In other instances, they are forced to bring an animal in because of its location in a high-use area.

Although no Network protocols have been established for initial treatment of live stranded animals, those facilities which are extensively involved in the rehabilitation of pinnipeds have developed their own protocols. Facilities such as Sea World and the California Marine Mammal Center have developed step-by-step procedures for the physical examination of animals when they come in for treatment and for initial treatment of common problems such as dehydration or malnutrition. Other facilities such as the New England Aquarium rely on the experience of their animal care staff rather than developing written protocols.

During the 1977 stranding workshop, a number of papers were presented on the basic care of stranded animals (Geraci and St. Aubin, 1979). Included were procedures for stabilizing animals, formulas for feeding animals, and medical treatment. In the intervening decade the level of knowledge has increased. Although variations on a theme, each facility has developed its own formulas for feeding both neonate and older pinnipeds and cetaceans.

The blood chemistry of animals often is now routinely checked to detect abnormalities. Variations from normal values have become one of the most important elements in determining what treatment regime should be prescribed (G. Early, pers. comm., 1989 and S. Sadove, pers. comm., 1989). The relatively large number of captive bottlenose dolphins has provided baseline values for hematology and serum chemistry (Asper et al., in Leatherwood and Reeves, 1990). Although values for rarer species are not readily available, one individual commented that such values from more common species could be used because those providing treatment should be looking for gross variations from the norm (J. Geraci, pers. comm., 1989). Progress has also been made in using blood chemistry to indicate stress levels in cetaceans (Thomson and Geraci, 1986, St. Aubin and Geraci, 1988, Parker and Schroeder, 1987, and Schroeder, 1987). Similarly, comparisons of the blood chemistry of healthy and unhealthy pinnipeds are available (Dierauf et al., 1986 and Roletto, paper presented to the Eighth Biennial Conference on the Biology of Marine Mammals, Pacific Grove, California, 1989).

As methods have become more sophisticated, the survival rates of neonatal and juvenile pinnipeds have risen. General protocols for evaluating neonatal harbor seals are now available (Dierauf and Dougherty, 1983). Experience has shown that a relatively high percentage of young animals stranding in New England have lungworms, and stranded animals brought in for rehabilitation are routinely treated for such parasites (G. Early, pers. comm., 1989 and Geraci and St. Aubin, 1987).

STANDARDS

The question of what standards should apply to facilities engaged in the rehabilitation of animals has, at times, been troublesome. There are two aspects to the issue: (1) facilities which are not licensed for public display for which there are no standards and (2) the

applicability of Animal and Plant Health Inspection Service (APHIS) standards to animals undergoing rehabilitation in facilities licensed for public display.

Both the Marine Mammal Commission and APHIS commented in the context of the review of the permitting process on the issue of stranded marine mammals undergoing treatment. The Marine Mammal Commission addressed the possibility of establishing some standards for facilities treating such animals:

> "Temporary maintenance of an animal in isolation or in a substandard facility may be acceptable for a stranded animal to assess its condition or to provide medical treatment. Many of the problems regarding long-term maintenance of stranded animals in sub-standard facilities could be eliminated by establishing minimum requirements for facilities participating in stranding networks. The Commission recognizes, however, that it may be in the best interest of stranded marine mammals to authorize short-term maintenance at, or participation by, some facilities that do not meet all of the standards, and that provision should be made for exceptional circumstances" (Letter from John R. Twiss, Jr., to Nancy Foster, August 24, 1989).

Although the focus of their comments was on the display of formerly stranded animals, APHIS did comment, "The area of stranded marine mammals is becoming more and more of a problem in both licensed and unlicensed facilities" (Letter from R.L. Crawford to Nancy Foster, June 5, 1989).

There was surprising unanimity that the development of a minimum set of standards would be useful. Some individuals suggested that such standards are absolutely necessary (L. Price, pers. comm., 1989 and J. Lecky, pers. comm., 1989). There was some disagreement, however, as to what such standards should be. An individual in APHIS suggested that they might need to be less stringent than existing standards for public display but that establishing a floor with basic requirements would be useful. It would give all facilities the same minimum base (R.Crawford, pers. comm., 1989). An individual engaged in the rehabilitation of animals expressed an argument for more rigorous standards for both facilities engaged exclusively in rehabilitation and those which are also display facilities. He admitted that such standards might be idealistic and acknowledged that his own facility sometimes would have difficulty meeting space requirements. He commented that with sick animals one needs to be even more careful. He also pointed out that display animals are likely to have adapted to conditions at the facility (G. Early, pers. comm., 1989).

Only one of the Regions has attempted to define standards for such facilities. The Northwest Region asks that a facility provide some basic information before it is approved as a rehabilitation center. Applicants are asked to provide: a description of physical facilities and capacity; evidence that they have access to veterinary care; a description of on-site water systems including flow volumes and filtration rates; and measures taken to prevent the transmission of infections or diseases to other animals (Letter from B. Norberg to Ken Lee, June 26, 1989). For the most part, the other Regions have assumed that if a facility is engaged in public display and meets APHIS standards, it has a minimum ability to provide care for stranded animals. It should be noted, however, that not all facilities engaged in the rehabilitation of marine mammals are covered by APHIS and that stranding activities may impinge on a facility's ability to meet APHIS regulations.

One of the more difficult issues to address in terms of standards is that of space requirements. It is an issue which affects both facilities engaged in public display and those exclusively engaged in rehabilitation. It affects both large and small facilities. The number of live stranded marine mammals is inherently variable, and there are events such as epizootics which can strain the capacity of any facility. The Northeast Regional stranding coordinator addressed this issue:

> "Most of our Letter of Authority holders' facilities cannot meet (existing) APHIS standards. If they had to, they would be put out of business. Sometimes during the very busy part of the stranding season (i.e., harbor seal pupping season) a facility may bring in a number of stranded marine mammals that puts them over the number of animals for space requirements. But this situation is temporary and usually short-lived" (T. McKenzie, pers. comm., 1989).

The person working with rehabilitation of stranded animals for Sea World of San Diego described how the capacity of even a large facility can be taxed by an anomalous event. During the El Niño event in 1983, they were bringing in as many as ten pinnipeds per day. To accommodate the large number of animals, they added some haulout areas to some of their unused cetacean pools. When that measure proved to be inadequate, they began using some isolated hall areas in their hospital. They could not have anticipated their load, nor could they have provided treatment for the animals if they had been required to meet space requirements.

There are times when requiring facilities to adhere to space standards would be counterproductive. During pupping season or during an epizootic, large numbers of animals are likely to strand. APHIS recognized this in a policy statement issued in 1981:

> "The Department has no desire to interfere with the operation of a stranded or beached animal program that is operated for the benefit of the animals involved. For this reason, we have established a policy of exempting beached or stranded marine mammals from compliance with space requirements. Thus, licensed exhibitors would not have to abide by the space requirements for beached animals that are in separate pools.... In cases where beached animals cannot survive in the wild and are not suitable to be placed elsewhere as an exhibit animal (i.e., blind, missing flippers, deformed, etc.), they will be considered as requiring permanent medical attention. If such animals are not euthanized but are kept for breeding or study to advance animal care, they will not be subject to compliance with space requirements. Other standards will apply however" (Memorandum entitled "Policy on Beached/Stranded Marine Mammals" from D.F. Schwindaman to W.D. Prichard, December 29, 1981).

The same memorandum stated that public display facilities would have to meet all other standards for animals undergoing rehabilitation--a policy which has since been changed. It also mentioned that facilities engaged only in the rehabilitation of animals would not have to be licensed. They would, therefore, not be covered by APHIS standards.

There is another dimension to the problem when animals are retained for a period of time and displayed. As early as 1977, the Department of State Police in Oregon made an inquiry about the legal status of such animals. A facility which had been permitted for 10 harbor seals was holding 17 with 2 more to be born. The placement and semi-permanent maintenance of stranded animals was a factor in the facility exceeding its capacity (Letter from Robert R. Fisher to Robert W. Schoning, May 20, 1977). There have also been cases when cetaceans were kept beyond an initial period of stabilization in pools which did not meet minimum size standards and displayed to the public. An individual from APHIS has suggested that if a marine mammal is placed in a public display area that all standards should be met (R. Crawford, pers. comm., 1989).

Another issue which affects both licensed and non-licensed facilities engaged in rehabilitation is whether stranded animals should be isolated or quarantined during treatment. Most stranded animals are by definition unhealthy, and they often carry diseases which could be transmitted to other animals. After taking cultures from three Atlantic white-sided dolphins, the authors of one paper concluded that such animals can

carry potentially pathogenic organisms and "(n)ewly rescued marine mammals should be segregated from healthy animals if possible" (Buck et al., 1988).

It should be noted that larger display facilities take pains to separate stranded marine mammals from their display animals because they do not want to risk the possibility that a rescued animal might transmit a disease to their permitted animals. Rescued animals are normally maintained in separate enclosures and pools. Existing regulations for public display facilities provide that provisions be made for isolation of animals under certain conditions. These provisions are contained in 9 C.F.R. § 3.110:

> "(d) Newly acquired marine mammals shall be isolated from resident marine mammals until such newly acquired marine mammals can be reasonably determined to be in good health. Any communicable disease condition in a newly acquired marine mammal must be remedied before it is placed with other resident marine mammals.
>
> (e) Any primary enclosure containing a marine mammal with an infectious or contagious disease shall be cleaned and sanitized in the manner prescribed by the attending veterinarian. No additional animals shall be introduced into the primary enclosure prior to such cleaning and sanitizing procedures. Any marine mammal exposed to a diseased animal shall be isolated for observation for an appropriate period of time as determined by the attending veterinarian.
>
> (f) Temporary holding facilities with adequately and properly designed pools, tanks, restraining devices or primary enclosures shall be provided for isolation, medication, treatment, and other purposes such as transfer and training of marine mammals. The pools, tanks and primary enclosures may be less than minimum size in both lateral dimensions and depth when used in special situations when prescribed by the professional staff for temporary usage."

To reduce the possibility of disease transmission, the definition of "isolation" with respect to marine mammals provides that animals must be physically separated and that there be a "separate, noncommon, water circulation and filtration system for the isolated animals" (9 U.S.C. § 1.1).

Because stranded animals are likely to carry communicable diseases, the same provisions should apply to stranded animals. Facilities which are licensed by APHIS should isolate stranded animals until it is determined that they will not transmit diseases to display animals. In the case of facilities which are not covered by APHIS standards, a provision requiring isolation of diseased animals and separate water sources would seem to be appropriate.

Beyond the rather obvious need to isolate animals, several individuals suggested specific minimum standards for rehabilitation facilities and, by extension, for the treatment of stranded animals in display facilities (J. Antrim, J. Lecky, T. McKenzie, L. Price, and J. Roletto, pers. comms., 1989).

The most common suggestions were that access to veterinary care and a pool be required. Several people suggested that food quality and preparation standards should be in place. The measures necessary to meet food standards can reasonably be developed in advance of strandings.

Several people also suggested that minimum water quality standards be established. Existing APHIS standards provide that cetaceans be kept in water with a salinity of 15-36 parts per thousand. They also provide that the coliform bacteria count shall not exceed 1,000 MPN (most probable number) per 100 ml. of water. One individual expressed concern about water quality requirements, however. He stated that maintenance of water quality can be difficult if a facility is strained by an epizootic.

Some individuals mentioned that general sanitation standards including such things as clean and dry haulout spaces would be useful. Finally, two people pointed out that the ability to control temperature was important with pinniped pups.

MONITORING

Given the mandate in the MMPA that rescued animals be returned to their natural habitat if feasible, NMFS has a responsibility to monitor animals undergoing rehabilitation. At some point it is incumbent on the agency to make a determination that an animal should be returned to the wild or that an animal should be retained in captivity.

The agency has not done a good job, however, in monitoring animals undergoing rehabilitation. In each of the Regions, animals that NMFS was either unaware of or which had spent substantial periods of time in substandard facilities and were being publicly displayed turned up in the course of this study. One individual candidly stated that NMFS had made no effort to follow up on the status of a cetacean which had been retained for 2 years.

One of the problems is that no regularized process of notification exists. In two Regions stranding reports are not submitted directly to the Regional Offices. The channels for receiving reports of live stranded animals are informal, and while individuals working with the Stranding Networks in these offices have been diligent in remaining in touch with facilities by telephone, any turnover in staff results in a situation where NMFS may lose track of animals. Only the Southwest Region has a system whereby animals are tracked and their disposition recorded. The Northwest requires notification within 15 days if an animal is taken in for rehabilitation and a requirement that an animal be released within 60 days unless alternative arrangements are made, but they do not necessarily monitor the eventual disposition of animals.

As indicated above, there is hesitancy on the part of the display industry to have such animals entered into the Marine Mammal Inventory because of an impression that some groups do not appreciate the fact that live stranded animals are in poor health and will have a higher mortality rate. Several individuals suggested that a separate inventory be kept if such an inventory is necessary. If, however, such animals are tracked as part of normal Stranding Network activities, such an inventory may not be necessary. If NMFS is to fulfill its responsibilities, it would seem advisable to regularize reporting and require formal notification when a stranded animal is received and of any change in status. The Vice President of Cetacean Society International pointed out an additional advantage to such monitoring. He stated that such records could give us an idea of the success of rehabilitation efforts. If a facility was particularly successful in addressing specific problems, their experience could be used to help other facilities (W. Rossiter, pers. comm., 1989)

A factor which contributes to the problem is that procedures for making a determination as to whether an animal should be released are not in place. In most instances, the determination is only made on the initiative of the facility holding the animal. Some animals remain in indeterminate status for years. Without an absolute deadline for making such a determination, the proclivity to postpone actions which are not necessary is likely to continue. In their comments on marine mammal care and maintenance regulations, the Marine Mammal Commission suggested that a definition should be added of what constitutes temporary holding including a maximum time limit for such a designation (Letter from J. Twiss, Jr. to N. Foster, August 24, 1989).

When asked as to when such a decision could normally be made, there were a number of responses. In some ways the responses varied depending on whether the individual had

more experience with cetaceans or pinnipeds. The experience with pinnipeds is that often animals can be restored to the wild within 2 or 3 months. This is reflected in the policy of the Northwest Region. They require that an animal be restored to the wild within 60 days unless other arrangements have been made.

The person responsible for the New England Aquarium's stranding program said that within 3 months a decision could be made as to whether an animal would be eligible for release. He did emphasize that the decision would not necessarily correspond with the release date but that treatment should have progressed to the point where such a determination could be made. He emphasized that it should be possible to make such a call for both cetaceans and pinnipeds even if the animals required further rehabilitation before release (G. Early, pers. comm., 1989). Another individual commented that such a decision could be made within 2 months with pinnipeds and within 3-4 months with cetaceans (S. Sadove, pers. comm., 1989).

Those whose experience has been primarily with cetaceans point out that even after an extensive rehabilitation period such a determination may be difficult (D. Odell, pers. comm., 1989).

Another person pointed out that differences in treatment regimes may make a standard period difficult. He pointed out that some facilities merely release animals after they have been stabilized and treated while others may train the animals to catch live fish. He pointed out that even with pinnipeds the appropriate period may vary. While younger animals usually recover within 60 days, rehabilitation could take years with older animals. He also stated that some animals have epilepsy and need medication, but it is possible that they could be weaned off medication within 4 or 5 years (J. Antrim, pers. comm., 1989).

During a meeting to review the MMPA permitting process in Chicago on November 29, 1989, participants expressed the view that 1 year would be an adequate period of time for making such a determination in most circumstances.

To date, the primary responsibility for such a decision has been with the attending veterinarian of the facility treating the marine mammal. To avoid the perception of conflict of interest (particularly in the case of cetaceans), the final determination probably should rest with NMFS. Because the attending veterinarian is the one most familiar with an animal's condition, such a decision should be made in consultation with the attending veterinarian. One individual suggested that each Region would have to set up a board to review the written records of each animal. There are two reasons why such an approach would seem to be inadvisable. First, the number of animals for which such a determination needs to be made is relatively small. Second, it is an unduly cumbersome method of making such a determination.

Related to the question of whether there should be a time limit before the determination is made is the question of the utilization of animals during rehabilitation. The majority of the problems that the agency has encountered in this area has been due to animals being publicly displayed before a final determination is made as to their status. APHIS has expressed concern that in at least one facility the majority of animals being displayed are formerly stranded animals for which their standards are not applicable (R. Crawford, pers. comm., 1989). Within the last couple of years, there also has been a facility displaying animals undergoing rehabilitation despite the fact that the pool did not meet minimum space requirements.

NMFS has not set a policy regarding this issue. In some Regions, facilities are allowed to display such animals. In others, such as the Northwest, public display of animals undergoing rehabilitation is absolutely prohibited. The Network coordinator in the Northwest justified such a policy by pointing out that an effort should be made so that

marine mammals restored to the wild do not become tolerant of humans. An increase in tolerance levels could result in a greater number of fisheries interactions (B. Norberg, pers. comm., 1989). Others within the agency were also sympathetic to a strict policy of not displaying such animals.

Several private individuals expressed the view that as long as programs stressed minimal contact and minimal conditioning to captivity, public display should not be precluded. Another pointed out that contact with captive display animals could actually help socialize an animal, increasing the chances for successful readaptation once an animal is restored to the wild (G. Early, pers. comm., 1989).

DISPOSITION OF REHABILITATED MARINE MAMMALS

The issue of the disposition of rehabilitated marine mammals has persisted since the hearing held in 1973. At that time, some of the public display facilities argued that they should be able to make the determination. They argued that without their efforts and expenditures, an animal would have died anyway and that they should have the option of retaining an animal. The feeling that such a policy would be the most equitable approach persists (G. Early, pers. comm., 1989 and S. Spotte, pers. comm., 1989).

Given the mandate of the MMPA, however, that animals be returned to their natural habitat, if feasible, NMFS does not really have the option of letting the facility which has treated the animal determine its ultimate disposition. In actual practice, however, the application of the policy has been considerably less demanding. In most instances, if a facility went to the trouble and expense of rehabilitating an animal and wished to keep it, arrangements have been made to provide either a Letter of Agreement or permit to allow the facility to retain the animal.

There is a marked contrast between the number of pinnipeds and the number of cetaceans restored to their natural habitats. Hundreds of pinnipeds but only a handful of cetaceans have been released. In 1980, Sea World released a rehabilitated female Atlantic bottlenose dolphin, and Miami Seaquarium released a rehabilitated male Atlantic bottlenose dolphin (White and Francis-Floyd, 1988). Two other bottlenose dolphins were released in 1989 by Sea World, one of which had not technically stranded but had been taken in for rehabilitation after it was in a distressed situation. In 1984, Mystic Marinelife Aquarium released a rehabilitated Atlantic white-sided dolphin (Buck et al., 1988). In 1987, the New England Aquarium released three long-finned pilot whales (Mate, 1989 and Early and Rumage, 1989). In 1989, Sea World released a Bryde's whale although the scientist involved expressed doubts over its survival after release (D. Odell, pers. comm., 1989). At least four other cetaceans have been held briefly for observation without undergoing extensive treatment programs--an Atlantic bottlenose dolphin, a long-finned pilot whale, an Atlantic spotted dolphin, and a dwarf sperm whale.

The disparity in numbers between pinnipeds and cetaceans reflects the differences in numbers of live stranded animals, the fact that stranded cetaceans are often in poor physical condition, and the more advanced state of treatment techniques for pinnipeds.

Although the goal of the rehabilitation program as defined by the MMPA is to return animals to their natural habitats, some scientists have raised questions as to whether reintroduction of animals may adversely affect wild populations.

Mortality of neonates and juveniles may be a part of normal population regulation. The question of whether it was wise to intervene in natural processes was raised in the 1973 hearing on the disposition of live stranded marine mammals. In written comments, Marineland of the Pacific stated that many of the live stranded sea lion pups which they treated had lungworms. They raised the issue of whether deaths from the parasite might

be either a natural population regulation mechanism or might indicate that some animals were lacking a natural immunity and hypothesized that it could be to the detriment of wild populations for such animals to be restored. They noted that even after being rehabilitated, such animals might not be capable of reproduction.

More recently, studies of pinnipeds have shown that natural mortality of sea lion pups may approach 50 percent in the first year of life (Aurioles and Sinsel, 1988). Steiger et al., 1989, found that harbor seal pup mortality ranged from 12-26 percent in the first month of life in the inland waters of Washington.

It has been pointed out that one of the causes for the death of neonates has been genetic defects, and there is some concern that restoration of such animals to wild populations may have an impact on the gene pool (S. Sadove, pers. comm., 1989). One individual stated that up to 30 percent of the stranded harbor seal pups on which they conducted necropsies had congenital defects (R. Osborne, pers. comm., 1989).

Some scientists have expressed concern that restoration of animals to the wild could introduce diseases back into healthy populations. Concern has been raised that wild populations could either be exposed to a disease that was responsible for the initial stranding or other diseases to which the animal might have been exposed during captivity. Certainly, it would be irresponsible to reintroduce an animal with a contagious disease; however, it is possible in many instances to determine whether an animal can transmit a disease to wild populations. As an example, it would not be consistent with the goals of the stranding program to release an animal being treated for leptospirosis if it is still shedding leptospires in its urine. In terms of diseases contacted in captivity, it is worth pointing out that if any captive animals were precluded, breeding programs to reintroduce endangered species to their natural habitat would be pointless. Furthermore, both normal husbandry standards and, in some instances, APHIS standards would reduce the chances of such an occurrence.

To date, there have been few attempts to monitor either the rates of survival of animals restored to the wild or their impact on wild populations. This deficiency was noted at the 1977 workshop on strandings. There was also a recommendation that all released animals be marked or tagged (Ridgway and Prescott in Geraci and St. Aubin, 1979). It is somewhat disconcerting to note that there still is uncertainty as to whether rehabilitated animals can or should be tagged. Just as verification studies are necessary to determine survival of animals released at the site of a stranding, it should be assumed that verification of survival after release is an integral part of the rehabilitation process.

Even in the cases where large numbers of rehabilitated pinnipeds have been released, the totals are small enough in relation to wild populations that major impacts should not be anticipated. The one exception may be with harbor seals in the Wadden Sea area off the coast of the Netherlands. At the Eighth Biennial Conference on the Biology of Marine Mammals, the Seal Rehabilitation and Research Centre in Pieterburen, the Netherlands, reported that they had a successful rehabilitation rate of more than 80 percent and claimed that up to 25 percent of the extant wild harbor seal population of the Dutch Wadden Sea area may be made up of rehabilitated animals.

Generally, little effort has been taken, however, to monitor such trends. No one knows what the long-term survival rate is for released animals. There have been some studies based on radio-tagged harbor seals and tag recoveries from pinnipeds released in the Southwest where NMFS provides orange tags to rehabilitation centers which indicate that some animals do survive (P. Payne and C. Rimmer, 1982; J. Harvey, 1988; and D. Seagars, 1988). The minimal data provided by such studies cannot provide an indication of survival rates. One member of the Stranding Networks indicated that once harbor seal pups pass through the first 2 weeks of adaptation to the wild, chances of survival increase markedly

(G. Early, pers. comm., 1989). There are only two reports, however, of rehabilitated animals successfully reproducing (J. Roletto, pers. comm., 1989). Based on the fact that there have been births to rehabilitated animals retained in captivity, certainly reproductive success is within the realm of possibility.

Although not directly parallel to animals which stranded in an unhealthy condition, NMFS Southwest Region has had some experience with one species which may indicate that it is possible to release animals from captivity and have reproductive success. For several years, they have conducted a head start program for Hawaiian monk seal pups (Monachus schauinslandi). The population is small enough and monitored closely enough so that it can be confirmed that animals did survive and that females have now borne pups (W. Gilmartin, pers. comm., 1990).

With the smaller number of cetaceans which has been released and the lack of opportunity to observe animals on rookeries as is possible with pinnipeds, it is even more difficult to determine the success of rehabilitation efforts. Recently, some released animals have been equipped with either radio or satellite tags. Scientists were able to track one of three pilot whales released by the New England Aquarium for over 3 months after it had been equipped with a satellite tag. They were also able to determine that it had joined a pod of wild pilot whales. The Bryde's whale released by Sea World was also equipped with a satellite tag and was followed for 8 days at which time the signal stopped (D. Odell, pers. comm., 1989).

Several individuals suggested that there should be some standards for release (S. Sadove, L. Price, and E. Gardner, pers. comms., 1989). It should be noted that a condition for release was contained in the Meibohm memorandum which defined agency policy. The memorandum provided that an animal should be released in the presence of other animals of the same species. While agreeing that such a policy was desirable, one individual did raise a concern. He said, "Release with a group of its own species should probably be attempted, yet this may not even be the proper thing to do since the animal is probably not part of that social group....(S)ome guidelines should be constructed if for no other reason than to encourage research on the effect of release with different groups of conspecifics" (S. Sadove, pers. comm., 1989).

Such a policy could present another problem for rehabilitation facilities, though. Recently, there have been strandings of pinniped species such as hooded and harp seals which were probably at the southern limit of their range. To release the animal where others of its species are present could prove to be expensive and a logistical nightmare. If standards are set, NMFS should consider this problem, and possibly consider a requirement that such animals be released near the recovery site at the same time of the year.

Although it may be in the category of determining whether or not an animal should be released and not in the category of standards for release, several individuals emphasized that more than just the physical condition of animals should be considered. They emphasized that the behavior of the animal may be just as important as a determinant of survival in the wild. There are a number of anecdotal accounts of pinnipeds which have been released which had been so acclimated to humans that they did not exhibit an avoidance reaction.

In speaking specifically of dolphins, one individual suggested that baseline studies of release areas should be conducted to determine such things as availability of prey and the presence of other animals of the same species (E. Gardner, pers. comm., 1989).

Several individuals indicated that halfway houses might be set up to allow animals to readapt. In 1987 an experiment of this nature was conducted with two Atlantic bottlenose dolphins which had been initially captured in 1980. Unfortunately, the usefulness of

efforts to carefully control each stage of readaptation was reduced because the animals could not be monitored after release (Oceanic Research Communication Alliance, 1988).

Until it is determined that current methods are ineffective, however, it could be a waste of resources to set up such facilities. Such a determination can only be made if released animals are more effectively monitored for survival. Furthermore, the number of rehabilitated cetaceans which could be released is not large enough to support such a facility.

As an alternative to restoring animals to the wild, it has been NMFS policy to encourage the use of rehabilitated animals for public display as a substitute for capture from wild populations. For almost a decade, no permits to capture pinnipeds for public display have been issued. Although it has been stated policy for some time, the language in § 109(h)(3) of the MMPA has necessitated some benign hypocrisy at times. The requirement that an animal be returned to its natural habitat if "feasible" has been interpreted to mean if it is possible.

During the period when there was a demand for pinnipeds, healthy animals which probably could have been returned to the wild were transferred to public display facilities in lieu of permitting a take from the wild. When such animals went into permanent captivity, there was often a statement that the animal was incapable of being returned to the wild. The determination was most often left up to the rehabilitation facility and supporting documentation was usually lacking. In other instances, an animal was transferred with no determination made as to whether it could be returned to its natural habitat.

As the demand for California sea lions and harbor seals diminished, it became obvious that far fewer animals were incapable of being released. Currently, almost all rehabilitated pinnipeds are being restored to the wild.

In terms of management decisions, the utilization of rehabilitated animals as a pool for public display is consistent with the purposes of the MMPA. The Marine Mammal Commission has provided an interpretation of § 109(h)(3) which could resolve the dilemma:

> "If one defines 'feasible' as 'capable of being accomplished,' the Service may have no choice but to ensure the release of any animal that can be released. The dictionary also defines 'feasible' as 'suitable' or 'logical.' If these latter definitions are adopted, the Service must require the release of rehabilitated marine mammals only when it is likely to be successful and otherwise makes sense. The Service should consider adopting such a definition of feasible when it revises its regulations.
>
> It does not make sense to release animals that are already in captivity if they could be used as substitutes for marine mammals to be taken from the wild. Therefore, release, although possible, may not be feasible. Using rehabilitated animals rather than wild animals would reduce the chase and capture as well as removal of animals from the wild, eliminate the possibility of disease transmission to wild populations, reduce the need to acclimate animals to captivity, avoid the need to retrain rehabilitated animals for life in the wild, and help pay the cost of rehabilitation programs" (Letter from J. Twiss, Jr., to N. Foster, August 24, 1989).

Although it is unlikely that the Congress was prescient enough in 1972 to anticipate that the pool of rehabilitated animals could serve as a substitute for taking from the wild, it does not do violence to the spirit of the MMPA to interpret the word "feasible" in such a manner.

The vehicle used to place rehabilitated animals with public display facilities has most often been a Letter of Agreement. Such Letters provide authority to the facility to permanently maintain an animal and extends the conditions which would be required if the animal had been taken under the provisions of a public display permit. The exceptions to placing such animals under a Letter of Agreement have been animals which are transferred out of the country and, more recently, rehabilitated cetaceans.

The justification for using such a mechanism to place animals has been that the permitting process can be relatively lengthy. If the action involves the transfer of the animal, the facility which has borne the cost of treatment would have to incur additional costs to maintain an animal until the permit was processed. In addition, the capacity of a rehabilitation facility could be strained if it was unable to transfer animals after the treatment regime was completed. By issuing Letters of Agreement through the Regional offices, NMFS was able to match available animals with display facilities and reduce demand for animals from wild populations.

One individual expressed the frustration of Regional personnel with the length of time it takes to process both permits and Letters of Agreement:

> "I have no idea why Letters of (Agreement) are used instead of the permit process for rehabilitated animals going into public display. One process isn't any quicker than the other. NMFS needs a system that processes requests to put rehabilitated animals on public display in an expeditious fashion. Waiting 3 months to get authority to transfer an animal is ridiculous. I'm not opposed to using the permit process for rehabilitated stranded animals, but I am opposed to the length of time it takes to process the applications, and so are all of the Letter of Authority holders in the Northeast Region network" (T. McKenzie, pers. comm., 1989).

Since the initial Letter of Authorization was issued in 1973 for the permanent maintenance of a stranded killer whale, concern has been raised that such Letters circumvent the normal permitting process. Of particular concern has been the fact that the process does not provide an opportunity for public review and may be the result of a single individual's opinion. Perhaps as important as the lack of public review is the fact that the Marine Mammal Commission does not review such Letters. It often helps to have the perspective of another agency with expertise.

The Marine Mammal Commission has expressed the view that in most instances such animals should go through the permitting process. To minimize the problems caused by the processing time for permits, the Commission raised the possibility of allowing an animal to be maintained at a facility for an interim period pending approval of a permit.

A related issue has been raised in the past. Some animals have gone into facilities which had never gone through the review process for a permit. Since the passage of the MMPA, animals have been transferred to 20 facilities which had not previously obtained a marine mammal permit. A significant percentage of controversies related to rehabilitated animals has been related to such facilities. In 1984, the Southwest Region pointed out problems it had experienced with one of these facilities and recommended that a permit be required before placement of a rehabilitated animal in a public display facility which had not previously received a marine mammal permit. In a memorandum, they stated, "Changing the procedure would provide for a one time public review of an application for a permit submitted by a new facility. Any comments concerning the applicant's facilities or care of the animal could be resolved through the permit process. Once a facility obtained a public display permit, the Letter of Agreement process could be used to authorize placement of additional animals" (Memorandum from E. Fullerton to R. Roe, December 6, 1984). Although it has not been placed into a formal policy statement, current NMFS policy follows this procedure.

During the reauthorization of the MMPA in 1988, amendments were added which may have increased the importance of having an opportunity for public review of facilities seeking marine mammals under Letters of Agreement. Previously, applicants were required to meet APHIS standards for care and maintenance, and confirmation that a facility met such standards could be obtained through an inspection. Additional provisions were added to the MMPA in § 104(c)(2):

> "A permit may be issued for public display purposes only to an applicant which offers a program for education or conservation purposes that, based on professionally recognized standards of the public display community, is acceptable to the Secretary and which submits with the permit application information indicating that the applicant's facilities are open to the public on a regularly scheduled basis and that access to the facilities is not limited or restricted other than by the charging of an admission fee."

Although Letters of Agreement currently carry provisions that a facility must meet APHIS standards, even the addition of language requiring that standards for education or conservation programs be met would not necessarily be sufficient. The addition of such standards will mean that widely varying programs will have to be examined and that judgment must be exercised. A procedure to evaluate such programs will be necessary.

OTHER ISSUES

Some environmental and animal welfare groups have expressed concern that some facilities are participating in the Stranding Networks as a means of gaining display animals. Although it is possible that a couple of facilities have used the Networks in the past to obtain animals for display, the concern is probably overstated. In the case of the facilities which are most active in rehabilitating marine mammals, the cost of their Network activities is far more than the cost of obtaining a healthy animal from the wild through the permitting process.

In the case of pinnipeds, facilities have had difficulty placing rehabilitated animals which could not be returned to the wild. Both harbor seals and California sea lions are currently in surplus in the zoological community. Table 4 shows the ISIS listings for Zalophus californianus. Currently, demand for such animals can be satisfied from captive born animals, and many facilities have initiated active measures to control the number of captive births. Every rehabilitation facility indicated that there were problems placing pinnipeds that could not be restored to their natural habitats but were suitable for public display and indicated that they could use the agency's help in locating facilities which would accept rehabilitated animals.

There is a different issue looming on the horizon in the case of pinnipeds. Some facilities indicated that limits on their capacity might necessitate making a decision as to whether animals which could not be returned to the wild should be euthanized even if they could survive in captivity. As examples, they mentioned animals which require continuing medication, e.g., those subject to convulsive and other neurological disorders, or animals with conditions preventing readaptation to the wild, e.g., blindness.

In the past, NMFS has not always anticipated problems and has then had to confront them on a crisis basis. The surplus of some species of pinnipeds is unlikely to abate, and the agency should examine its policy on the disposition of animals which cannot be restored to the wild.

As indicated above, the number of cetaceans which has been successfully rehabilitated is quite small. The time and resources invested in animals which have died and in animals

TABLE 4

ISIS RECORDS OF ZALOPHUS CALIFORNIANUS

At the end of 1988, 57 U.S. zoological institutions had animals. 16 facilities had live births in 1988.

Total animals held in captivity by U.S. zoological institutions
1986--278
1987--282
1988--310

Number of captive births in U.S. zoological institutions
1986--33
1987--32
1988--33

Animals advertised as surplus by U.S. zoological institutions
1988--17 males and 6 females by 14 institutions
1989(Jan.-May)--11 males and 2 females by 9 institutions

Advertisements placed by U.S. zoological institutions seeking animals
1988--1 female
1989 (Jan.-May)--1 male

Information provided by Kristen Vehrs of the American Association of Zoological Parks and Aquariums

which have eventually recovered has been out of proportion to their market value. The rate of success is low enough that anyone anticipating that they will receive display animals from Stranding Network activities is likely to be disappointed. Although not currently a problem, the issue may have to be reassessed as treatment techniques improve.

Another issue which has arisen in the past is the utilization of rehabilitated animals for scientific research. In some instances, information can be gained which is incidental to treatment regimes. As an example, information on blood chemistry and feeding are necessary in order to treat an animal. Such information also can contribute to general knowledge of the species and ultimately help to improve recovery rates. There also has been non-intrusive research unrelated to treatment. As an example, last year, information was collected on sound production by a pygmy sperm whale and two beaked whales.

The Southwest Region has also made provision for utilizing rehabilitated animals for scientific research in lieu of taking from the wild. The conditions in their Letters of Authorization include: "Rehabilitated marine mammals that have been determined by a licensed veterinarian to be unfit for return to the wild may be transferred...for research purposes to a scientific permit holder." Although such a provision is consistent with the goal of substituting rehabilitated animals for captures from the wild, it may not be specific enough. The provisions in the MMPA require the agency to make a determination as to the legitimacy of research projects and without specifying that the animal be transferred for an approved project, the agency may not be fulfilling its responsibilities under the Act. The fact that an individual holds a scientific research permit does indicate that the individual is performing bona fide scientific research, but unless the transfer is tied to a specific permit, there are no assurances that the project for which the animals will be used has been reviewed.

RECOMMENDATIONS

1. NMFS should establish reporting requirements of live stranded animals so that it knows when animals are brought in for rehabilitation and can monitor their progress. A database should be set up to make the information readily accessible. The Regional Office should be notified within 30 days whenever an animal is taken to a facility for rehabilitation and whenever there is a change in the status of an animal, i.e., it dies, is euthanized, is released, or goes into permanent captivity. The reporting conditions should be placed in Letters of Authorization. Not only would such an action enable the agency to keep track of animals in rehabilitation status, but it would also give a better idea of the number of animals being restored to the wild and relative recovery rates. Such a database should be maintained separately from the Marine Mammal Inventory because there are facilities extensively engaged in rehabilitation which are not public display facilities and the MMI database is not structured to contain the information which would be necessary to monitor rehabilitation.

2. There should be a time limit on the period before a determination is made as to whether an animal should be released. Without the imperative imposed by such a time limit, the agency is likely to continue having problems monitoring animals, and animals are likely to remain in indeterminate status for long periods of time. The recommended period for making a <u>determination</u> is within 6 months. The determination does not necessarily mean that an animal will be released within that period but that a decision as to releasability must be made. A provision should be added allowing an extension if a determination cannot be made, but the decision to extend the period must be an affirmative action. The 6-month period was chosen as a reasonable compromise between the normal treatment period for pinnipeds and cetaceans. Another option would be to set separate time limits for cetaceans and pinnipeds. The responsibility for making the determination should lie with the agency. Such a determination should be made in consultation with the attending veterinarian. The burden of evidence should be on the side of anyone attempting to prove

that an animal is not a candidate for release. Both the physical condition of an animal and its behavior should be considered in making the determination.

3. Regulations should be promulgated setting minimum standards for rehabilitation facilities. Such standards should be applicable to both public display facilities and facilities exclusively engaged in the rehabilitation of animals. Each Network should specifically approve rehabilitation facilities based on such standards. Letters of Authorization should only be issued to facilities which can meet the minimum standards. It is recommended that a committee be set up to determine which standards are appropriate. The committee should include individuals from rehabilitation facilities, APHIS, the American Association of Zoological Parks and Aquariums, the International Association for Aquatic Animal Medicine, the animal welfare community, and NMFS. If such a course is not adopted, standards should be promulgated providing for the isolation of animals with communicable diseases, separate water for isolation areas, and veterinary care.

4. Provisions relating to the display of animals undergoing rehabilitation should either be written into regulations or part of the Letter of Authorization granted to a facility. It is recommended that, before a determination is made as to whether an animal is releasable, display of animals be allowed only under the following conditions:

a. No animal may be placed with animals on public display if it potentially could transmit a disease to permanently captive animals.

b. Facilities displaying such animals must meet the APHIS standards for display. NMFS should communicate to APHIS that it will not have to make exceptions for animals undergoing rehabilitation. If an animal is displayed to the public, it should meet display standards including the standards for space. If a facility cannot meet such standards, it should not have the animals in an area accessible to the public.

c. If a determination has not been made as to the ultimate disposition of an animal, it should not be trained for performance. Only passive viewing of animals undergoing rehabilitation should be allowed until a determination is made that they cannot be returned to the wild. Training for performance could be detrimental to an animal's behavior once it is released.

5. Until there is evidence that standards for release are needed beyond the existing exhortation to release an animal in the presence of others of its own species, no changes need to be made in existing procedures. The existing standard should be put into a policy statement. NMFS needs to consider the problem of rehabilitated animals which were at the limits of their range when they stranded.

6. Tagging or marking of released animals should be mandatory. Such a provision is included in Letters of Authorization from two Regions. It should be added to all Letters of Authorization. Other regions should consider adopting the practice of the Southwest Region of providing tags for released animals. All tag resights should be reported to the Regional Offices. Efforts to place radio or satellite tags on rehabilitated cetaceans should be encouraged. The interpretation that such tagging exercises require a scientific research permit have served as an impediment to such efforts. It is questionable whether the definition of take should include activities involving rehabilitated animals. It can be argued just as easily that monitoring of long-term survival is part of the rehabilitation process. Efforts to determine survival rates, reproductive success, and impacts of rehabilitated marine mammals on wild populations should be encouraged. Until more information is known, claims of success in reintroduction to the wild are unable to be confirmed.

7. NMFS should make an unequivocal policy statement that rehabilitated animals will be used as a pool for public display animals. Use of such animals in lieu of taking from wild populations is consistent with the goals of the MMPA. It should adopt the Marine Mammal Commission's definition of feasible and incorporate that definition into regulation. Alternatively, NMFS should seek an amendment to § 109(h)(3) of the MMPA expanding acceptable actions to include utilization for public display in lieu of taking from wild populations.

8. NMFS needs to issue a policy statement on how placement of animals into permanent captivity will be handled. There are three viable options:

a. Keep the existing system of issuing Letters of Agreement with specific exceptions when an application for a public display permit will be required. Those exceptions include a facility which has not received a public display permit in the past. Such an exception allows a one time public review of a facility and its programs. After obtaining an initial display permit, a facility could obtain additional pinnipeds through Letters of Agreement. All cetaceans would have to be permitted. Although a policy of differentiating between cetaceans and pinnipeds may be questionable legally, there is a pragmatic reason for making such a distinction. The numbers of rehabilitated cetaceans are much smaller than the numbers of pinnipeds, and waiting for a permit is less likely to strain the capacity of the treatment facility. Furthermore, virtually every cetacean going into permanent captivity has been retained by the facility which has rehabilitated the animal. Time constraints are not as pressing if the facility is merely seeking authority to retain an animal for which it is already providing accommodations. The advantage of allowing pinnipeds to be placed under Letters of Agreement is that it is a more expeditious process than obtaining a public display permit. The disadvantage is that the agency loses the opportunity for input from the public and the Marine Mammal Commission. If such a procedure is retained, Letters of Agreement must contain language reflecting the requirements added during the most recent reauthorization of the MMPA.

b. Require permits for all rehabilitated animals. The major advantage to such an approach is that it opens the process up to public review. Standards for education and conservation programs require judgment, and on such issues, it is important to have a wide range of views. The major disadvantage is that the permitting process can take a substantial period of time, and rehabilitation facilities will be unduly burdened.

c. Require permits for all rehabilitated animals but allow the transfer of animals pending the issuance of the permit. Such a solution would have the advantage of expediting movement of animals so that the resources of rehabilitation facilities would not be strained. It would require preliminary screening, however, because there could be major problems in placement of an animal if a permit were to be denied. It is also possible that such an action could amount to a prejudgment of an application for a public display permit.

9. If it is decided to continue to utilize the Letter of Agreement as a means of placing animals, a determination must be made on whether to place the authority to issue such Letters in the central office or to place the authority in the Regional Offices. There are problems with either option. In the past, the central office has not always known of the issuance of Letters or that specific animals have been moved into permanent captivity. Because they issue public display permits, knowledge of how many animals a facility has and the record of its husbandry practices are important information. On the other hand, the Regional Offices are responsible for monitoring the rehabilitation of animals and are responsible for making the determination as to whether an animal should be restored to its

natural habitat. Whatever the ultimate decision, it would require a greater degree of cooperation and coordination between the central office and the Regions. Formal structures should be set up for handling transfer of rehabilitated animals in an expeditious manner.

10. Scientific research incidental to treatment of live stranded animals should be allowed during rehabilitation. Research which is non-intrusive such as recording of sonar transmissions should also be allowed. Other types of research on animals undergoing rehabilitation should be prohibited without a scientific permit. Transfer of rehabilitated animals in lieu of a take from the wild should be allowed, but it should be limited to specific research projects for which the investigator has received a permit.

11. NMFS should sponsor a workshop on rehabilitation techniques so that methods could be shared among facilities treating live stranded animals. There were sessions on treatment at the 1977 Stranding Workshop, but there has not been such a meeting since then. Several facilities indicated that such a workshop would be valuable. It could be conducted in conjunction with either the biennial conference on the biology of marine mammals or the annual meeting of the International Association for Aquatic Animal Medicine.

SCIENCE

Background

An informal quid pro quo exists between the National Marine Fisheries Service and scientific members of the Marine Mammal Stranding Networks. In return for responding to strandings and providing basic information, the researcher is given opportunistic access to tissues from marine mammals without the necessity of applying for a research permit. The relationship has been productive. A large number of scientific papers have been published using information gained from stranded animals, and NMFS has received basic data on strandings. A sampling from the literature is provided in the bibliography. There is potential for even more knowledge to be gained.

Ease of access to tissues has not resulted in abuses of the MMPA's prohibition on the sale of marine mammal parts and has not been an enforcement problem. In line with the self-imposed admonition not to fix something that is already working, recommendations in this area are not designed to inhibit research. There are measures which could be taken, however, which would enhance the Networks' capacity to produce scientific information. Some of these measures are directly related to the agency's management responsibilities.

In the case of some cetacean species, virtually all of our scientific knowledge has come from stranded animals. As an example, the pygmy sperm whale (Kogia breviceps) was once considered to be a rare species. It has seldom been observed in the wild. It is, however, the third most commonly stranded cetacean on the east coast of the United States. The frequency of strandings has resulted in a reassessment of its relative abundance (J. Reynolds, pers. comm., 1989), and most of the life history of this species has been developed from stranded specimens (Mead and Potter, 1989).

Stranded marine mammals have been the source of morphometric information (see for example Mead et al., 1982). If specimens are properly curated and records sufficiently detailed, such work can take place even years after animals strand. As an example, Purves and Pilleri (1978) did a detailed study of the false killer whale (Pseudorca crassidens) fifty years after a mass stranding of 127 animals using skeletal material that had been preserved in the British Museum. Other basic information such as the range and distribution of particular species has been gained from stranded animals.

Much has also been learned of the life history of cetaceans, especially from mass strandings. Information on age structure, growth, reproductive activity, social structure, and prey species has been gained from stranded animals. Although use of hematology and DNA analysis to determine genetically discrete stocks is relatively recent, stranded animals may contribute to the definition of population stocks. Knowledge of the biology of Atlantic white-sided dolphins (Lagenorhynchus acutus) (St. Aubin and Geraci in Geraci and St. Aubin, 1979 and Sergeant et al., 1980), spinner dolphins (Stenella longirostris) (Mead et al., 1980), and false killer whales (Pseudorca crassidens) (Odell et al., 1980) increased markedly as a result of studying mass strandings. Similar information can be developed from a sampling of individually stranded animals (Walker et al., 1986).

Stranded animals also have provided information on diseases affecting marine mammals. In the early 1970s, an effort was made to systematically survey the diseases of stranded animals in Los Angeles County (Schroeder et al., 1973). Similarly, efforts have been made to survey causes of death in the Pacific northwest (Stroud and Roffe, 1979 and Steiger et al., 1989). Specific diseases are discussed in the chapter on public health and welfare.

Numerous species of parasites have been extensively documented in marine mammals (Dailey and Gilmartin, 1982; Dailey and Otto, 1982; Dailey and Stroud, 1978; and Geraci and St. Aubin, 1987). It has been hypothesized that parasites may be responsible for some cetacean strandings (Dailey and Walker, 1978; Morimitsu et al., 1986; and Ridgway and Dailey, 1972). Experience with the rehabilitation of pinnipeds has demonstrated that infestations of lungworms and heartworms may contribute to significant mortality among young animals (G. Early, pers. comm., 1989 and J. Roletto, pers. comm., 1989).

Certain parasites in stranded animals may have value as biological markers and are, therefore, potentially useful for management activities. Differences in species of parasites may indicate geographic separation and help in the definition of specific population stocks. Because the life cycle of some parasites is specific to individual species of fish, differences in parasites also may indicate variations in prey utilization (Walker and Cowen, 1981 and Dailey and Otto, 1982)

Until both unit effort in terms of stranding responses and the correlation between stranding numbers and frequency and actual mortality can be determined in terms of both species and areas, stranding records will be of limited value in determining trends in population abundance and absolute mortality. Two European scientists have attempted to correlate the records of harbor porpoise (Phocoena phocoena) with population abundance. One concluded that a reduction in the number of strandings in the Netherlands was indicative of a decline in abundance (Smeenk, 1987). The other concluded that there was insufficient information in the United Kingdom to make such a comparison (Brown, 1975).

At best, stranding records may be able to document major changes in mortality and abundance. They can be used as a diagnostic tool and give advance warning of developing problems. The number of stranded bottlenose dolphins (Tursiops truncatus) from the coastal migratory stock of the U.S. mid-Atlantic region was of sufficient magnitude during the 1987-88 die-off that it was possible to support a designation of stock depletion. In general terms, though, stranding reports are unlikely to provide more than indications of variations in abundance. The Networks have reached the point, however, where detection of mass mortality events is possible. In the case of the 1987-88 die-off, historic records enabled researchers to determine that something unusual was occurring soon after the strandings started (J. Mead, pers. comm., 1989). In 1984, a leptospirosis epizootic in California sea lions (Zalophus californianus) was initially identified by the Stranding Network, and it was possible to follow the outbreak geographically (B. Norberg, pers. comm., 1989). The Networks were also able to detect a smaller outbreak in 1988 (Gage, 1989). Similarly, previous stranding records helped in the early detection of an influenza epizootic in harbor seals (Phoca vitulina) in 1979-80 and provided the information to make a determination that it was over (Geraci et al., 1982). There was also an event of lower magnitude in 1982-83 in harbor seals.

Without an idea of unit effort and the capabilities of Stranding Network members, the value of baseline data is limited. Hofman discussed the importance of such information:

> "The utility of long-time series data will depend upon a number of variables, including their reliability and comparability over time. For example, changes in reporting or notification procedures, response team interest and capability, methods of recording and reporting data, etc. could cause or contribute to misinterpretation of the data. Thus, quality control and maintenance of an accurate record of changes in reporting and response practices are essential if stranding data are to be of any value for detecting and monitoring population or habitat changes. If systems for reporting and responding to strandings, and the quality of data collection/recording/archiving are variable over time, the resulting data may have little or no value for detecting and monitoring population and habitat change, and

the time, money, and effort used to collect such data could therefore be wasted" (Hofman in Reynolds and Odell, in press).

An effort has been made to index other types of strandings in some areas. A study was performed to determine, among other things, the recovery rate of stranded sea otters on a portion of the California coast. The author concluded that numbers of people using the beaches did not influence the likelihood of reports being received. Rather the awareness of people that such carcasses should be reported seemed to be the most influential factor. She concluded that an effort should be made to systematically walk beaches in order to recover stranded otters. Without such an systematic effort, creation of a useful index of mortality would be difficult (Jameson, 1986). It should be noted, though, that differences in sizes between sea otters and other marine mammals could affect the chances of an animal being initially observed. In the case of sea turtles, an effort has been made to systematically walk beaches at regular intervals in some areas of the southeast.

Although there are indications that the stranding response for cetaceans and pinnipeds is virtually total in some areas and there is comparability with prior year records, an effort has not been made to objectively confirm such assumptions, and no attempt has been made to establish index areas to detect and monitor trends.

Even without quantification of unit effort, data from strandings can have management value. Epizootics can be detected. Stranding data potentially could provide information on the population dynamics of specific stocks. Variations in age or sex composition could indicate changes that merit further investigation. Shifts in age at sexual maturity could indicate a population which is undergoing or recovering from stress or decline. Although stranding data could be employed as a management tool, not all of the Regions have made a significant effort to identify or collect information which could be used for management decisions.

Stranding data may be most useful in determining human interactions with marine mammals. The Marine Mammal Event Program of the Smithsonian Institution has asked respondents to indicate if there is evidence of human interaction in stranding reports on cetaceans, but the capabilities of Network members vary considerably, and documentation of interactions is not always included (J. Mead, pers. comm., 1989). Nevertheless, in at least one instance, stranding data alerted management personnel of a potentially serious interaction between harbor porpoises in California and a halibut gillnet fishery (Seagars et al., 1986).

Under the provisions of the MMPA, NMFS is responsible for managing and monitoring marine mammal-fishery interactions. Prior to the 1988 amendments to the Act, quota determinations were made for general permits and small take exemptions. The 1988 amendments mandated a reporting system to gauge the magnitude of such interactions. Stranding data could be useful in this respect. As an example, in the case of sea turtles, seasonal data have been used to establish a correlation between shrimping activity and strandings (Murphy and Hopkins-Murphy, 1989).

Attempts have been made to use stranding data to determine the impact of fisheries on selected species. The Los Angeles County Museum systematically recorded gray whale (Eschrichtius robustus) entanglements (Heyning and Lewis, 1990) and met with groups of fishermen who voluntarily agreed to time and area closures in order to reduce the number of affected whales (H. Bernard, pers. comm., 1989). Efforts to quantify interactions between fisheries and bottlenose dolphins (Tursiops truncatus) in the Southeast Region have been less successful because of the limited data base (Burn and Scott, 1988 and Reynolds, 1985). The first of Reynolds' recommendations related to stranded animals:

> "Increase efforts to locate, recover, and necropsy carcasses of bottlenose dolphins and other marine mammals washed up on beaches. Conduct necropsies as completely as possible, paying special attention to indications (e.g., rope marks) that the mortality might have been incidental to fishing activities" (Reynolds, 1985).

Ironically, since 1985 the response rate by competent personnel to strandings of bottlenose dolphins has probably decreased in areas of Florida, as has the number of necropsies, because such strandings have become commonplace (L. Price, pers. comm., 1989).

Most easily documented are the fishery interactions when netting material or other fishing gear has remained on the animal. Instructions for such situations, however, are not specific enough. They do not include recording mesh size or, even better, sending a sample of the material to the Network coordinator. Instances where appendages have been cleanly cut off are also likely to have been caused by fishery interactions. Identification of net marks is more difficult, and rake or other marks may be mistaken for net marks.

Studies on the west coast have shown that a significant number of dead stranded pinnipeds have been shot (Hansen, 1983 and Stroud and Roffe, 1979). It is generally recognized that bird pecks may often be mistaken for gunshot wounds, and without supporting documentation, reports of such wounds must be suspect. With fewer pinnipeds being necropsied, the magnitude of such interactions cannot be gauged. Two active Network participants in the State of Washington offered different views on the number of harbor seals that had been shot. One thought that it was the majority of dead stranded harbor seals. The other stated that he had rarely seen conclusive evidence. He pointed out that it is difficult to trace bullet holes because many of the carcasses are moderately decomposed, and it is not often that both an entry and exit wound are present or the bullet is recovered. Accurate determination of whether animals have been shot also is important because of NMFS' enforcement responsibilities.

Information from strandings can also provide information to help in the recovery of endangered or threatened species. The draft recovery plans for both the humpback whale (Megaptera novaeangliae) and the northern right whale (Eubalaena glacialis) emphasize the importance of obtaining information from stranded animals. In the case of the latter, stranding data have also contributed to identifying collisions with ships as a significant mortality factor.

Another reason for determining when human interactions are responsible for a marine mammal's death is that animals so killed are generally healthy and for certain studies their tissues may have superior scientific value. The majority of stranded animals are unhealthy and may not provide a representative sampling of normal conditions.

Network members and NMFS personnel agree that reports of human interactions are important and that an effort needs to be made to train respondents in their identification. The Northwest and Alaska Fisheries Center has produced a report to help respondents identify human interactions (Hare and Mead, 1987). If it is widely distributed to Stranding Network members, it should improve reporting. Actual training and/or preparation of a videotape could supplement the report.

Indirect evidence for stock identification and for determining potential fishery interactions can be acquired by analysis of stomach contents. Identification of fish otoliths and squid beaks can contribute to the knowledge of the prey species of marine mammals (Fitch and Brownell, 1978 and Clarke in Bryden and Harrison, 1986). Clarke emphasizes the importance of such information:

> "When cetaceans strand and die their stomach contents may tell us a great deal about the diet even if only small pieces of prey organisms are present. These are of

particular value since stranded cetaceans include many of the smaller, rarer and poorer known species. Although stranded animals might be expected to have stomachs containing a bias towards inshore species of prey because they must have passed through shallow water to reach the beach, Ross compared stranded cetaceans with others caught offshore, and concluded that there was not such a bias and that stranded animals gave a correct indication of the normal diet at least in the region sampled.

"...it should be possible to really explore the biomass relationships between cetacean predators and the species upon which they prey. To achieve this aim every effort should be made to collect the complete stomach contents of all stranded odontocetes and of good numbers of commercially killed odontocetes. ...Not only will diet research lead to a much greater knowledge of cetacean distribution, migration, depth of feeding, and behaviour, it will also lead to much greater knowledge of cephalopod and fish biology, particularly of the species which are difficult to catch by midwater trawls, etc." (Clarke in Bryden and Harrison, 1986).

Some systematic studies have been conducted on stomach contents (Lowry and Folk, 1987; Hacker, 1986; and Seltzer et al., 1986). However, concern has been expressed that the prey items in the stomachs of stranded animals may not reflect the diet of healthy animals (Seltzer et al., 1986). A presentation by Sekiguchi at the 1988 Conference on the Biology of Marine Mammals seems to confirm this assumption in the case of some delphinid species. She found that stranded animals had fewer prey items and less variety in species than did presumably healthy animals.

With evidence that marine mammals may be affected by biotoxins contained in their prey, relatively intact prey items may also be important for analysis. Brevetoxin has been detected in stranded bottlenose dolphins, and saxitoxin has been detected in stranded humpback whales (Geraci, 1989; Anderson and White, 1989; and Geraci et al., 1989). High levels of ciguatoxin and maitotoxin were detected in two monk seals during a die-off in 1978 (Gilmartin, 1987).

The 1977 marine mammal stranding workshop defined three levels of scientific information which could be gained from stranded animals (See Appendix B). Level A data is basic minimum data to be collected and corresponds to the information required on stranding report forms. It includes: the name of the investigator, date, location, species, voucher specimens, condition of the animal or carcass, length, and sex. Collection of Level A data is mandatory for all members of the Stranding Networks. Level B data is designed to supplement Level A data and includes observations on ocean and atmospheric conditions, the disposition of the carcass, and three types of samples to be taken: teeth or other material for age determination, reproductive tracts, and stomach contents. Level C data includes necropsy results and collection of tissues and parasites. Levels B and C data are considered proprietary information and are not reported to NMFS. Because they are proprietary information, collection of such information is at the discretion of the respondent.

Although there are differences in format, each of the Regions has Level A data on their reporting forms. It should be noted that because of potential problems with enforcement, the disposition of the carcass has been added to the list of mandatory information. Information on retention of voucher samples, however, is not required to accompany the reports on some of the reporting forms. The Southwest Region has a space asking if photographs were taken and the Southeast Region has a space for noting if voucher materials were taken. The reporting form from the Southwest Region does make provision for recording evidence of human interactions. Not all of the reporting forms contain information explaining how to obtain and report the requested data. As an example, how to determine the sex or even how to measure the length of an animal may not be explained.

Although long-time members of the Stranding Networks are familiar with the levels of data, none of the Networks routinely distributes the descriptions which were prepared by the workshop. One very active member of the Network commented that she was unaware of Levels B and C data until she attended the 1987 workshop on strandings (J. Roletto, pers. comm., 1989). Other individuals have similarly indicated that they are unfamiliar with Levels B and C. Even those familiar with the material indicated that there is a need to provide instruction on how to obtain the various levels of data (J. Roletto, pers. comm., 1989 and R. Tarpley, pers. comm., 1989).

The various levels have not been re-examined since the 1977 workshop. Since that time advances in science have been made, and the relative importance of various data may have changed. As an example, the 1977 workshop placed considerable emphasis on parasites. More recently, such things as collection of tissues for contaminant analysis may have assumed greater importance. The 1977 report contains no reference to collecting materials for genetic analysis. Several individuals commented that it would be useful to re-examine and possibly revise the three levels of data. (J. Mead, pers. comm., 1989; M. Johnson, pers. comm., 1989; R. Tarpley, pers. comm. 1989; and T. McKenzie, pers. comm., 1989).

From the perspective of the agency, there is information which could be used for management purposes if it were to be included on the reporting forms. The most significant of these may be evidence of human interaction. It has implications for both management and enforcement. Because of a tendency for overreporting gunshot wounds, documentation should be required and an effort should be made to train members in the identification of such interactions. Mead and Hare also emphasized that it should be recorded if there is no evidence of human interaction:

> "The absence of marks or wounds indicating human interaction is as important to document as its presence. Full length photographs and close-ups of the appendages and head of these specimens should be taken. It is important to comment on negative findings such as the absence of entanglement scars and genuineness of bird pecks on the report to indicate that these items were examined" (Hare and Mead, 1987).

Mead (Pers. comm., 1989) indicated that if accurate ratios of animals exhibiting evidence of human actions to those which did not could be developed, the ratios could serve as an advance warning system when problems develop.

In addition to human interactions, there were other suggestions of data that might be required under Level A. Two individuals suggested that environmental information such as observations on weather, tide, and currents be required (J. Reynolds, pers. comm., 1989 and G. Early, pers. comm., 1989). Although such information could be useful, it should be noted that it is available from other sources such as the National Weather Service. Data reconstructed from official sources is likely to be more dependable than the observations of Stranding Network members.

Two individuals suggested that records of voucher materials, e.g., skeletal parts or photographs, be required so that confirmation of other information such as species identification can be made (J. Heyning, pers. comm., 1989 and J. Reynolds, pers. comm., 1989). As noted above, the original recommendations for Level A data included a requirement for voucher specimens. Although the Southeast Region does request information on voucher specimens, there may be a complicating factor in adding it to the reporting form. As currently structured, most of the reporting forms only list required information. Although collection of voucher specimens should be encouraged, it is unlikely that it can be required for all stranding responses.

Several individuals suggested that it would be useful to have cause of death reported. One individual stated that more information is needed on marine mammal diseases and that there could be public health implications (M. Johnson, pers. comm., 1989). Others pointed out that cause of death was not likely to be accurate unless a necropsy was performed by a qualified veterinarian with a marine mammal background. The Southwest Region requests information on the cause of death for animals taken in for rehabilitation. There is another issue in this area, however. Investigators collecting information requiring time and funding have a proprietary interest in that information. To require its disclosure of information in the case of actions that are not themselves mandatory can compromise an individual's ability to publish findings.

There is, however, a degree of frustration with the amount of data collected never published (R. Tarpley, pers. comm., 1989; H. Bernard, pers. comm., 1989; and J. Calambokidis, pers. comm., 1989). Even NMFS itself has such data (H. Bernard, pers. comm., 1989). A member of the Northwest Stranding Network suggested that if the information is not published within a reasonable period of time, it should be made generally available to the public (J. Calambokidis, pers. comm., 1989). There may be basic information which is important for management purposes which is not of sufficient importance to merit publication. Mead pointed out that certain basic data will probably never be published or even get a research note but pointed out that if someone does something beyond the minimum requirement, it should be the right of the researcher to release or not release the information at his or her discretion.

A scientist at the National Marine Mammal Laboratory issued a cautionary note on expanding the information required on the reporting forms. As more information is requested, the willingness of individuals to become or remain part of the Network may be reduced. He stated that any additional reporting burden should be carefully weighed, and if NMFS considers certain information to be major important, it should consider funding that portion of the activity (R. Ferrero, pers. comm., 1989).

The degree to which individual members of the Stranding Networks are working beyond Level A data is inconsistent. In some areas, an effort is made to collect to Level C whenever an animal is fresh enough (S. Sadove, pers. comm.; 1989, R. Tarpley, pers. comm. 1989; and G. Early, pers. comm., 1989). In other areas, necropsies are performed on only a small number of the animals (D. Odell, pers. comm., 1989 and J. Cordaro, pers. comm., 1989). Others expressed the view that participants in the Networks have a responsibility to work beyond Level A data, and one suggested that willingness to do independent research be a condition of membership on the Networks (J. Calambokidis, pers. comm., 1989 and J. Reynolds, pers. comm., 1989). Because the only mandatory reporting provision is that Level A data be reported and because any other information which is collected is considered to be proprietary, NMFS cannot reasonably make additional research a condition of Network membership. In addition, there are areas where even gaining more complete responses for Level A data should be a goal, and to the extent that the agency can find individuals willing to respond and report Level A data, it should do so.

Accessibility of Levels B and C data is likely to remain a problem. The person responsible for the Southeast Network observed that he never sees Levels B and C data unless they are contained in a publication. Even then, the data are likely to be focused on a single issue, and the full range of data obtained by the researcher are not available to the public or scientific community.

Some members of the Networks also have expressed concern over the accuracy of the Level C data. Although the report of the 1977 workshop does contain general guidance on necropsies, not all members of the Networks have access to it, and a more detailed protocol would probably assist those who have more limited expertise. In the Southeast, an effort has been made to do demonstration necropsies. Network members have indicated that they

have been helpful. Several individuals have indicated an interest in developing a videotape which could be circulated to Network members. Such a videotape might also have value as a teaching tool for universities.

TISSUES

Perhaps the two words which best describe the collection and distribution of tissues from stranded animals are inconsistency and uncertainty. Both words are applicable to both the activities of the Network members and to NMFS' policy.

It has been recognized that stranded animals can increase our knowledge of marine mammals and the factors affecting them for some time. Even before the passage of the Marine Mammal Protection Act, special provisions had been made to ensure that researchers had access to tissues from stranded animals. In their response to an invitation to participate in the 1973 hearing on disposition of stranded animals, the California Department of Fish and Game described the procedures that they had in place prior to the passage of the Act:

> "Beached animals which die or must be dispatched and those animals which cannot return to the wild are utilized whenever possible by public universities, public scientific research institutions, and public exhibitional facilities under the authority of a permit" (Letter from E.C. Fullerton, Director, California Department of Fish and Game, to Gerald V. Howard, Southwest Regional Director, NMFS, May 17, 1973).

Each of the Regions handles authority to collect tissues from stranded animals and requirements for transfer of tissues differently. The Northeast Region grants authority for all holders of Letters of Authorization to collect tissues from stranded animals and has not required registration of the tissues. Nor has it placed any limitation on transfer of tissues to other researchers. The largest collector in the Region indicated that before they pass tissues on to a researcher, they require that the researcher have a formal letter from NMFS indicating that the research is legitimate. The process of issuing such letters has not been formalized, however (G. Early, pers. comm., 1989).

The Southeast Region also grants authority to Network members to collect tissues. For the most part they do not require registration of hard tissues. The files contain three letters notifying the agency that parts from specific animals had been retained. The Region does require that transfer of hard tissues to non-Network members be approved, but there has not been an effort to notify Network members of this requirement. In 4 years of recordkeeping, there have only been seven registrations or notifications that parts are being transferred. This constitutes a minuscule portion of the tissues which have been shared with researchers. The regional person working with the Network indicated that he did not know how many of the Network members were collecting and archiving tissues. Without such knowledge, it would be virtually impossible to know when tissues are transferred. The Letters of Authorization do contain a prohibition on the transfer of tissues to researchers who are not Network members. If it were observed, the provision might create difficulties. There are researchers outside of the Region who could not obtain tissues, and the ability of permitted researchers to obtain tissues might be compromised.

The Southwest Region has created different classes of respondents to stranding situations and limits the authority to collect tissues to those who have a legitimate research interest. They do not require registration of tissues and place no limits on transfer of tissues for research. A question has arisen as to whether parts can be transferred for educational purposes to non-research facilities.

As indicated above, the Northwest Region does not issue Letters of Authorization. It allows Network participants to collect tissues but retains authority over the tissues which are considered to be on permanent loan to the collector. The Region requires registration of both hard and soft parts, and one section of the reporting form serves as a registration form. The registrations are general, i.e., "carcass" or "skull" rather than attempting to register individual parts. Network participants are allowed to transfer parts to both researchers and educational institutions upon notification of the Regional office. The parts are transferred on loan, and authority over the parts remains with NMFS.

In Alaska, the Region requires the registration of hard parts from non-endangered species. Soft parts and parts from endangered or threatened species go to researchers under a loan provision and technically remain under the authority of NMFS.

In general terms, NMFS has little idea of what tissues have been archived and where they are. Virtually every member of the Stranding Networks interviewed in the preparation of this paper had retained some tissues. Many indicated that they had transferred tissues to researchers, but there was confusion as to whether such transfers were authorized, and under what conditions tissues could be transferred. One member indicated a degree of frustration and commented that it was difficult to know who is authorized to receive tissues (M. Rodriguez, pers. comm., 1989). In reality, the decision to transfer tissues is usually at the discretion of the individual who has collected the tissue, and there are few records of where tissues are. The MMPA gives NMFS the responsibility to prevent the commercial use of marine mammal parts or their products. Without documentation as to the legitimacy of the possession of parts, enforcement activities are a potential nightmare.

Some researchers have expressed concern over the quality of tissues received from some Stranding Network members. There have been cases where species and organs have been misidentified and tissues improperly preserved. One individual suggested that the authority to retain tissues be limited to institutions accredited by the American Society of Mammalogists. He did not favor individual collections because of concerns over what would happen if a researcher died, retired, or was transferred (J. Heyning, pers. comm., 1989). The same sentiment was expressed in a slightly different fashion by another participant. He indicated that tissues should only be retained in stable curated collections (M. Johnson, pers. comm., 1989).

A number of individuals expressed concern that there is little consistency in the collection and curation of tissues by Network members (J. Heyning, pers. comm., 1989; D. Odell, pers. comm., 1989; and G. Early, pers. comm., 1989). Recognizing that even such things as tagging and the paper used for recordkeeping could limit the utility of specimen materials, Heyning prepared a paper discussing basic curation techniques for the 1987 stranding workshop.

To date, the Networks have assumed that individuals involved have the knowledge to collect and preserve specimen materials and have had to rely on individuals without this training because of the voluntary structure of the Networks. There was virtual unanimity, however, that collection of specimen materials could be improved markedly if a generic protocol were developed to assist Network members. There are a number of elements which should be contained in such a protocol. It should be written in plain English. It should emphasize the collection of voucher materials. It should be written in a manner appropriate for field conditions. Data on life history should be collected. Sometimes even very rigorous protocols leave out important steps. As an example, there are significant omissions in the protocol for the Alaskan Marine Mammal Tissue Archival Project which was set up to archive tissues for contaminant analysis from marine mammals killed during subsistence hunts. It does not require the retention of vouchers and significant life history information is not collected. They do not require the retention of teeth for aging of an animal although the reporting sheet does contain a space for age of the animal and how it

was determined. Perhaps of even greater significance is the lack of a requirement that reproductive organs be examined (Becker et al., 1988). A protocol should also take cognizance of the different stages of decomposition of stranded animals.

During the late 1970s, the agency encouraged the collection of tissues for analysis of heavy metals and environmental contaminants. The 1979-80 Annual Report on the MMPA made reference to this:

> "Investigation of dead stranded marine mammals can be used as coastal zone indicators to monitor environmental changes, both offshore and in estuaries. For the last 12 years, large collections of frozen tissues have been maintained in freezer banks and are available for the analysis of heavy metals, pesticides and hydrocarbons. This technique may be an important baseline source of information regarding environmental change in marine ecosystems."

Despite encouraging the preservation of such tissues, the agency made little effort to see that analyses were done. Furthermore, no standards were established for collecting or preserving such tissues. While large amounts of tissue have been preserved, there is a question as to its utility. Several individuals in the Network have extensive collections, but doubt whether they will be utilized. One participant pointed out that he currently rents four freezer lockers which have tissues from over 400 marine mammals. He indicated that only 1-2 percent of the tissues had ever been analyzed, and that even if funding were available, it is unlikely that anybody would want to analyze more than another two percent of the tissues (J. Calambokidis, pers. comm., 1989). If the agency is going to request that individuals preserve tissues, it has a responsibility to give some assurance that the tissues ultimately will be used.

Because of concern over the quality of tissues, several individuals suggested that either regional centers or a national tissue bank be set up with tissues of known quality (T. Gornall, pers. comm., 1989; M. Johnson, pers. comm., 1989; and H. Bernard, pers. comm., 1989). NMFS has initiated a pilot project with the National Institute of Standards and Technology to archive a limited number of samples collected under ideal conditions and preserved in liquid nitrogen. Because of uncertainties as to the health of stranded animals, the collection will initially be limited to those that are incidentally killed in fisheries operations where a NMFS observer is present. The purpose of the national bank will be to provide tissues from animals which are assumed to be healthy for retrospective analyses of contaminants. Determining what is abnormal is difficult when there is only limited knowledge of what is normal. Mere detection of anthropogenic contaminants during an anomalous event does not imply causation. Without knowing levels of such contaminants in apparently healthy animals and knowing how such chemicals are processed by an animal, it will remain difficult to determine whether such contaminants are factors in mortality.

Even if expanded, the national tissue bank will be unable to provide tissues for all researchers. It, therefore, becomes important that once a protocol is established, tissues of known quality be archived in institutional collections. In addition to meeting the protocol, a data record containing significant life history data should accompany all such tissues and voucher specimens should be retained. In addition, information on the curation of tissues such as how old the tissue is and whether it has ever been repackaged should be available. There is some disagreement as to whether sub-optimal data should be included in reports. One individual indicated that no data are better than questionable data (J. Heyning, pers. comm., 1989). Another pointed out that if everything which does not meet protocols is excluded, it may severely limit the sample size. He commented that it might be better to include other data points with an asterisk. Information could still be learned, and the total sample might be more representative (J. Mead, pers. comm., 1989).

Concerns have been raised about the appropriateness of using tissues from stranded marine mammals for certain types of research. First, it has been pointed out that stranded animals are likely to be unhealthy and may not be representative of "normal" animals. Until comparisons can be made with apparently healthy animals, this question will persist. With the exception of the tuna fishery in the eastern tropical Pacific and the Japanese salmon driftnet fishery, little effort has been made to collect such animals with an eye toward determining normal conditions for animals. There is a lack of coordination between the fisheries component of NMFS and the Protected Resources component. One member of the Northeast Stranding Network pointed this out:

> "The agency's identification of needs has been rather incomplete and probably directly related to the degree of contact with a regional (stranding) coordinator. More importantly, the utilization of animals caught in incidental fisheries is pitiful. There is a large body of information that might be useful if it could be collected" (S. Sadove, pers. comm., 1989).

The stranding coordinator for the same region recognized the problem. She commented:

> "Data on incidentally taken animals are maintained by the NMFS Research Center. The minimum cetacean stranding data are kept at the Smithsonian, and more detailed data are kept with individual (Letter of Authorization) holders. The pinniped data are not kept in any one central place. The degree of coordination is just about zero" (T. McKenzie, pers. comm., 1989).

She went on to comment that coordination would be valuable in making comparisons of contaminant levels between stranded animals and incidentally caught animals. There is information which could also be of interest to those who are regulating fisheries. Surveys of stomach contents might alert them to potential problems with interactions.

The second reservation which has been expressed about the utilization of tissues from stranded animals is that such animals are in varying stages of decomposition, and there is uncertainty as to how degradation affects the utility of specific tissues. Some individuals have expressed the feeling that as long as the organ is recognizable, some useful information can be gained. They have indicated that things such as heavy metals and organochlorines can still be detected. One recent study indicated that time after death can affect the levels of organochlorines detected in certain tissues of a striped dolphin. Tissues were sampled and analyzed at intervals of 6, 13, 21, 29, 41, and 55 days (Borrell and Aguilar, 1990). For Stranding Network purposes, some additional analyses are needed. Most often, the significant differences in time are those between a freshly dead animal and an animal which has been dead for periods such as a few hours later, a day later, 3 days later, and 6 days later. In most areas, if tissues are to be taken they will be taken soon after an animal washes up on shore. It would also be of assistance to have a physical description of various decomposition stages including physical observations, e.g., bloated, and descriptions of the state of the organs to be sampled.

Several of the Networks list requests for tissues by specific researchers. For the most part, such a listing has not proven to be an expeditious means of matching requests for tissues with individuals likely to respond to stranding events. There have been exceptions, however. After an effort was made to obtain teeth from harbor porpoises for aging studies, the Southwest Network was able to provide NMFS' La Jolla laboratory with a good sampling (H. Bernard, pers. comm., 1989). The lists are updated infrequently. Some individuals have indicated that tissues taken by Stranding Network members vary considerably in consistency. Without a protocol for taking and preservation of tissues, it is unlikely that the Network will reach its potential in this respect.

What has developed is a much more informal method of obtaining tissues. Even Stranding Network members do not submit requests for tissues to the Network coordinators. The coordinator in the Northwest commented that he had not received a single request for tissues (B. Norberg, pers. comm., 1989). Instead of going through the Network, researchers generally contact Network members with reliable archived collections (J. Reynolds, pers. comm., 1989 and J. Calambokidis, pers. comm., 1989). In other cases, those responding to strandings have notified colleagues when they have obtained tissues of interest. In some ways, the informal channel has become self-reinforcing. As fewer requests are processed through the Network, respondents are less likely to note such requests and rely more on personal contacts with other researchers.

There is some question as to whether such tissues are readily available to researchers who are not Network members. Some Network members have expressed some reservations over doing a major portion of the work in tissue collection and preservation for someone else without being compensated for their time and effort. Perhaps at the opposite end of the spectrum, one individual expressed concern that NMFS might be granting monopolies and limiting access to tissues by legitimate researchers because only letterholders are authorized to collect tissues (R. Jones, pers. comm., 1989).

For the most part, Network members are willing to provide tissues to legitimate researchers. A researcher at the National Marine Mammal Laboratory stated that all a researcher has to do is pick up a telephone and give them a call. He stated that they do give tissues on permanent loan to principal investigators (R. Ferrero, pers. comm., 1989). It is somewhat less than certain, however, as to how researchers not involved in the Networks gain knowledge of banked tissues. Some members indicated that a clarification of their authority to transfer tissues would be desirable.

To assure access to tissues, several individuals suggested that a national tissue registry would be useful (D. Odell, pers. comm., 1989; J. Reynolds, pers. comm., 1989; and J. Heyning, pers. comm., 1989). One said that such a registry should be kept simple and stated that institutions accredited by the American Society of Mammalogists do keep records, and it would not be too difficult for them to comply (J. Heyning, pers. comm., 1989). Maintenance of such a tissue registry is probably beyond the capacity of the agency. The extra time and money involved in setting up a national tissue registry is probably of lower priority than some other tasks, e.g., monitoring pinniped strandings on a national basis, tracking animals during rehabilitation, and knowing who collects tissues generally. During 1989, the International Association for Aquatic Animal Medicine recognized the importance of knowing where tissues are available and attempted to set up a mechanism whereby members could indicate needs or availability of tissues. They publish a list twice a year in their newsletter. As another alternative, Network members have suggested setting up a computer bulletin board for posting available tissues and tissue requests (D. Odell, pers. comm., 1989 and R. Tarpley, pers. comm., 1989). Such a bulletin board could be used for other purposes, e.g., distributing protocols, alerting people if unusual events should arise, or moving stranding reports closer to real time.

There is one issue that frustrates those who collect and preserve tissues. People who get tissues do not always acknowledge those who originally collected them, and they do not inform collectors of how tissues or information is utilized. One individual commented that even NMFS personnel did not always acknowledge Network members in publications (J. Roletto, pers. comm., 1989). Some participants indicated that they had stopped sending tissues to people who did not acknowledge the source of tissues.

Unless the Network coordinators play a more active role in matching up available tissues with requests, informal channels are likely to continue to be used more often than the procedure of notifying the Stranding Network of requests. That is not necessarily a negative, though. With the exception of tissues from endangered or threatened species

which could contribute to research leading to the recovery of the species, an active effort to match requests with strandings is probably not worth the effort. After an individual in the Southeast made an effort to match a research permit for importation of tissues with a stranded animal, the Network member stated that he was more than willing to cooperate, but he had misgivings if it was to become a regular procedure. He expressed concerns that it might evolve into a situation where NMFS would dictate where tissues would go and that there might be competition for tissues from rare species (R. Tarpley, pers. comm., 1989).

Even if the Network coordinators do not play an active role in fulfilling requests for tissues, they should have some idea of who is collecting them and where there are archived tissues. Under such a situation, they should be able to refer researchers to those who have archived collections.

A large portion of the scientific research on marine mammals in the United States involves stranded animals. For the most part such research is not being performed under the provisions of scientific research permits. When the Marine Mammal Protection Act was initially passed, one of the exceptions to the prohibition on taking was for scientific research. The Act set up procedures for a permitting process for scientific research. Until 1977, the agency interpreted the Act to mean that utilization of tissues from stranded animals would require a permit. Frustrated with missed opportunities, an incipient rebellion against the procedure was growing in the scientific community until the workshop was set up in 1977 to deal with strandings.

At approximately the same time, the agency shifted its position. A decision was made to allow the collection of tissues from stranded animals without a permit. Instead, a procedure was initiated whereby general authority would be given to specific researchers under the provisions of Section 112(c). That section allows the Secretary to enter into contracts or agreements to fulfill the general purposes of the Act. Included in the findings is language encouraging scientific research. Given the requirements for specificity as to species, type of research, and impacts on populations the permitting requirements may not have been appropriate for stranding situations. The issuance of permits to non-members of the Networks could also raise several difficult questions. If a non-member of a Network has a permit, does that give him or her precedence in the collection of specimens from stranded animals? Can NMFS require the filing of baseline data by Stranding Network members? Who would have jurisdiction on site? NMFS has chosen a pragmatic means of ensuring that opportunities for research are not lost without doing violence to the spirit of the Act.

The Permits Division no longer processes permit applications requesting authority to collect specimens from stranded animals. Instead, the applicant is referred to the Stranding Networks. The Division has developed standard language for such applications:

> "A permit is not necessary to obtain specimens from species of marine mammals under the jurisdiction of the Department of Commerce which are beached or stranded in the United States. Regional Stranding Networks have been established to authorize individuals and organizations to salvage stranded marine mammals for scientific purposes and for the deposit of parts in bona fide museum collections. Stranding networks respond to stranding events, and a take occurs when a Network participant responds to an event. Subsequent disposition of tissues does not constitute a taking.
>
> "You may receive specimen materials by contacting the appropriate Regional Stranding Network to make arrangements for cooperative efforts with network participants to obtain the specimen material you wish to obtain...."

Although a policy has been established, it has never been formally stated. As a result, one Network member politely described the current situation, "There is some confusion as to the relationship between permits and the Networks" (R. Tarpley, pers. comm., 1989). There is even a degree of uncertainty among NMFS personnel. Inquiries have been made by an individual in the Southeast as to whether the agency should require a permit for researchers who are not part of the Network. The Network coordinator in the Southwest Region commented, "Any research permits dealing with stranded animals should be coordinated with the regional stranding coordinator, and such a provision should be a condition in any permit of this nature." The Network coordinator in the Northeast commented, "When a scientist applies for a research permit that will require obtaining parts from stranded animals, I always recommend that there should be a condition in the permit whereby the scientist must coordinate with the Stranding Network to obtain parts or samples." Although scientific research is clearly one of the primary motivations for the Network, the Northeast Stranding coordinator offered an opinion which would seem to run counter to the unformalized policy: "The goal of the Network should not be to serve as a substitute for the scientific permit process." Because the Northwest Region does not issue Letters of Authorization, tissue collection ostensibly takes place under one of two mechanisms. Several members of the Network indicated that they collected tissues under someone else's scientific permit. The second option is for collection of tissues to take place under NMFS' general authority and tissues remain legally the property of NMFS and the collector retains tissues under permanent loan. Despite the fact that Network members presumably collect under authority of permits, the Northwest Region has consistently opposed issuance of permits for stranded animals. As an example, in a memorandum from Rolland A. Schmitten to Nancy Foster dated February 8, 1990, the Northwest Region commented on a permit application:

> "We recommend that a permit not be issued for salvage of marine mammal specimen material from U.S. coastal areas because such material is available from regional stranding networks and research permits are not necessary. Issuance of research permits for beached and stranded marine mammals would be counterproductive and inconsistent with current NOAA Fisheries policy about handling these animals through regional stranding networks. The applicant should be advised to contact each of the Regional Stranding Networks to make arrangements for cooperative efforts with network participants to obtain the specimen materials they wish to obtain."

As indicated above, however, despite the recommendation that individuals contact the Stranding Networks, very few such requests are actually received. Because uncertainty remains as to the relationship between scientific research permits and the collection of specimens from stranded animals, NMFS should clarify its policy. If there is uncertainty within the agency itself, Stranding Network members cannot be expected to be aware of what authority exists to facilitate transfer of tissues to other researchers.

POLLUTANTS AND BIOTOXINS

When it initially passed the Marine Mammal Protection Act, the Congress recognized that ecological factors could have an impact on marine mammal populations but noted that there was inadequate knowledge of such factors. During the 1977 workshop on strandings, it was noted that marine mammals could serve as useful indicators of oceanic pollutants because they feed at the top of the trophic chain and tend to accumulate and concentrate such compounds (Geraci and St. Aubin, 1979). One paper expanded on this, "Small cetaceans may generally be expected to reflect the extent of local organochlorine contamination in marine ecosystems: they occupy high trophic levels, are large(ly) nonmigratory, and are relatively long-lived" (O'Shea et al., 1980).

There is growing concern that biotoxins from dinoflagellates and anthropogenic contaminants may affect marine mammal populations. Much of the information on toxicants has come from stranded animals. Because of a lack of standardization in collection of tissues and a lack of basic information on the physiological processes involving such compounds, however, it has been difficult to establish a direct causal relationship between toxicants and population dynamics.

There have been recent indications that marine mammals can be affected by biotoxins which are produced by marine dinoflagellates and passed through the food chain. In late 1987, there were a series of humpback whale (Megaptera novaeangliae) strandings on the northeast coast. Analyses of liver and kidney tissues indirectly indicated the presence of saxitoxin which is produced by the dinoflagellates Alexandrium fundyense and Alexandrium tamarense and causes paralytic shellfish poisoning in humans. Tests of Atlantic mackerel taken from the stomachs of the whales and caught in the area where the whales were feeding demonstrated the presence of saxitoxin in the viscera of the fish (Geraci et al., 1989 and Anderson and White, 1989). In subsequent analyses performed on Atlantic mackerel, NMFS has found that saxitoxin in mackerel viscera is relatively common. The possibility that such a toxicant is present in prey species may have to be considered in the recovery plan for the species.

Brevetoxin, which is produced by the dinoflagellate Ptychodiscus brevis, was detected in tissues and prey species of stranded bottlenose dolphins during the 1987-88 die-off. The principal investigator concluded that brevetoxin was the most probable cause of the mortality. The same study also found high levels of organochlorines in tissues taken from the animals (Geraci, 1989).

As a result of the evidence in these two studies, an expert consultation held at the Woods Hole Oceanographic Institution encouraged further investigation into the possibility that natural biotoxins are a factor in marine mammal mortality.

Although a number of studies have shown high levels of organochlorines in cetacean populations (O'Shea et al., 1980, Cockcroft et al., 1989, and Geraci, 1989), a direct cause and effect relationship to health and mortalities has not been established.

Noting that high concentrations of PCB and DDE had previously been correlated with decreased level of testosterone in Dall's porpoises (Phocoenoides dalli), Cockcroft et al. (1989) hypothesized that the levels of organochlorines in bottlenose dolphins off the east coast of South Africa could affect populations in two ways: by possibly adversely affecting reproductive capacity and by transferring levels of residues that could result in increased mortality of first-born calves.

In the St. Lawrence estuary in Canada a population of beluga whales that was extensively exploited has shown no signs of recovery despite being protected since 1973. The population has an abnormally low reproductive rate (Sergeant and Hoek, 1988). A systematic effort has been made to collect the carcasses of stranded animals and analyze both the pathology of the animals and the contaminant loads. High levels of DDT metabolites and PCB have been found (Masse et al., 1986). Benzo(a)pyrene adducts have been found in the DNA of the whales' brain tissue. There was also evidence of thymus and spleen atrophy, and the authors theorized that such a condition could be attributed to PCB noting that a similar phenomenon had been observed in laboratory animals exposed to PCB (Martinteau et al. 1988).

There is evidence that pollutants may have an impact on pinniped populations. One study demonstrated a correlation between reduced reproductive rates in ringed seals in the Baltic Sea and high levels of PCBs (Helle, 1976 and Helle, 1980). Helle found occlusions in the uterine tract of a significant number of the female seals but Reijnders (1984) expressed

reservations about directly attributing the occlusions to contaminant levels. Reijnders found a similar correlation between contaminant levels and lack of reproductive success in harbor seals in the Wadden Sea (Reijnders, 1980 and Reijnders, 1984). In a controlled experiment, he found that a diet higher in PCBs had an impact on reproduction which was not exhibited in control animals (Reijnders, 1986). The author of a study of contaminant levels in harbor seals found evidence that higher levels of PCBs in animals in Southern Puget Sound may have had an impact on reproductive success and juvenile mortality (Calambokidis, 1984 and Calambokidis, pers. comm., 1989).

Because the understanding of physiological processes involving contaminants in marine mammals is still minimal, it is difficult to establish a direct cause-and-effect relationship between impacts on population and contaminants. Two authors who have worked extensively in the field have commented on this:

> "In a number of cases the decline of a pinniped population has coincided with an elevation in the level of various contaminants. In some animals, reproductive failure has been associated with high levels of contamination in their tissues; but even in these cases no cause-and-effect relation between pollutants and altered physiological processes has been established" (Reijnders, 1984).

It should be noted that one exception to the generalization was a later study conducted by Reijnders in which he demonstrated a relation between reproductive failure in harbor seals and a diet of fish from polluted waters. While he was unable to establish the physiological mechanism, the evidence suggested that PCB levels did affect reproductive success (Reijnders, 1986).

In a survey of the scientific literature on the issue, Calambokidis concluded:

> "It is difficult to link pollutants directly to dysfunctions in pinnipeds. Though correlations between several disorders in pinnipeds and pollutants have been made, no study has firmly established a cause and effect relationship. Variations in the reported pollutant-related effects indicates a phenomenon more complicated than direct acute toxicity. Interactions between pathogens and pollutant-induced immunosuppression, as well as dysfunctions in steroid hormone regulation caused by pollutants, appear to be the most likely mechanisms that would explain patterns of disorders seen in different seal populations" (Calambokidis, 1984).

Reviewing the research on organochlorines and marine mammal reproduction, Addison (1989) expressed similar reservations and suggested further studies focusing on interactions between organochlorines and the production of hormones controlling reproduction.

Calambokidis points out two other problems in terms of the understanding of the physiological mechanisms of contaminants in marine mammals. Very little is known about possible interactions between various types of both natural and anthropogenic toxicants. The extent to which such compounds may indirectly contribute to mortality by affecting the immune system is also not known. The importance of such information was demonstrated in the 1987-88 die-off of bottlenose dolphins. Many of the animals which died may have succumbed directly to bacterial or virological infections. It has been hypothesized that either natural or anthropogenic toxicants or a combination of the two may have lowered their resistance to naturally occurring disease organisms.

There are a number of issues which must be resolved before an understanding of the impact of biotoxins and anthropogenic contaminants on marine mammals can be determined. Perhaps most important would be the collection of baseline data. It is hard to determine what is abnormal if it is not known what is normal. The lack of baseline information on normal contaminant levels was one of the problems facing the investigator

during the 1987-88 dolphin die-off. He noted that the only available information used a different methodology, making comparison difficult (Geraci, 1989).

Although a number of Network members have collected tissues for contaminant analysis, the cost of such analyses has prevented some of the members from running extensive examinations (S. Sadove, pers. comm., 1989). What has resulted is a supply of banked tissue which may be of limited utility. One of the problems is that there can be a difference in results depending on the laboratory. As an example, there were significant differences in reported pollutant levels for tissues from the same animals which were processed by different laboratories in one study (Calambokidis, 1984). The head of the Texas Stranding Network observed, "It is currently impossible to compare results from one area of the country with another because of different laboratory techniques" (R. Tarpley, pers. comm., 1989). He suggested that an effort be made to standardize the testing.

Perhaps an even greater problem lies in the fact that there is inconsistency in collection, handling, and preservation of tissues for contaminant analysis. There does seem to be a degree of consistency in which tissues are preserved for contaminant analysis. Blubber, liver, kidney, and muscle are the tissues most commonly collected. There is no standard as to where individual tissues will be collected, however, and it is possible that the collection site could influence results. As an example, one study found that contaminants were not evenly distributed in the blubber of fin whales (Aguilar and Borrell, 1985). By contrast, a study conducted on pollutant levels in harbor porpoise found minimal variation in contaminant levels in blubber taken from a variety of locations (Calambokidis, 1986).

Without standardization of tissue collection and studies done to determine whether or not there is consistent distribution of contaminants within an organ, a degree of uncertainty will remain. As an example of the questions which need to be addressed, does it make a difference if a tissue sample is collected from the left lobe of the liver (the most common collection site) or are contaminants evenly enough distributed that any part of the liver can be collected for contaminant analysis?

Without some type of standard protocol, the information which might be gained from members of the Stranding Networks will be limited. The Environmental Protection Agency held a meeting in the Northwest Region about 2 and a half years ago to determine whether Stranding Network participants could provide tissue samples which could be used to monitor pollutants. They reached the conclusion that as things currently stand, the Networks would not be able to meet the rigorous requirements for such tissues. Subsequently, the Northwest Regional Office of EPA asked for the development of a protocol on collection and curation of tissues so that stranding Network members could be used to provide materials allowing them to monitor pollutants in the environment (J. Calambokidis, pers. comm. 1989).

The problems of consistency in both analysis of tissues and collection of tissues were examined by a working group of the Scientific Committee of the International Whaling Commission (IWC). Their findings highlighted the limits of available knowledge:

> "Because of great differences in sampling and analytical techniques, the existing data are inappropriate for comparison and no reliable world distribution of pollutants in cetaceans can be detected from them" (IWC, 1986).

As in the case of tissues generally, the question of whether stranded animals are representative of marine mammal populations remains unresolved. After expressing concern about the use of information from stranded animals, the IWC report offered a recommendation:

> "...if tissue from stranded animals is collected, samples should be accompanied by a detailed description of the state of the animal (e.g., blubber layer thickness) and information on pathology" (IWC, 1986).

One of the papers presented to the Scientific Committee discussed the problem of analyses on unhealthy animals:

> "...a substantial portion of the samples used in studies of the incidence of organochlorine compounds on cetacean populations, mainly odontocetes, comes from specimens found dead on beaches. The causes that led the cetacean to its death are in many cases unknown, but it is frequent that they display evidence of having suffered a lengthy pathological process and have much lower lipidic reserves than is habitual in healthy animals.
>
> ...there exist(s) complete ignorance as to the destination of the organochlorines stored in the fat at the moment when the latter is mobilized for energy purposes. Two processes are possible: either that the pollutants leave the blubber in a way parallel to the lipids to which they were bound and pass into the blood, which will carry them to other tissues or excrete them, or that this does not happen and the concentration of organochlorines increases as the lipids are gradually mobilized.
>
> What is most probable, however, is that a combination of both processes takes place and the concentrations of pollutants in the blubber rise while the loss rates of organochlorines from this compartment to others and from the total of the body to the outside are activated.
>
> ...Logically, until this question is solved, the organochlorine residue levels found in cetaceans which show an abnormal fattening condition cannot be satisfactorily interpreted. This is of special importance for stranded specimens, but it must also be borne in mind for population studies as the nutritional parameters may be as important as the age or sex of the specimens sampled" (Aguilar, 1984).

Such uncertainties illustrate the need for baseline data from presumably healthy animals so that comparisons can be made with data from strandings. A systematic effort to collect tissues from animals incidentally caught in fisheries is warranted. There is also a need for tissues of known quality. The IWC working group recommended the formation of a tissue bank to provide such tissues but did not address the logistics of establishing such a bank (IWC, 1986).

The comments made by Aguilar highlight a point which is equally important for stranded and incidentally caught marine mammals. There are certain life history parameters which should be recorded and kept with any tissues which may be used for contaminant analysis. Blubber thickness should routinely be recorded as an indication of an animal's health. In addition, the visual observations as to the general physical health of an animal should be recorded by the investigator. Because levels of pollutants may be correlated with the age of an animal, an accurate determination of age is important. Some of the studies previously conducted have used length of an animal as a rough indicator, but it should be routine procedure to collect teeth from odontocetes so that growth layer groups can be counted (Hohn, 1980). Studies have also shown that both female pinnipeds and cetaceans lose organochlorine residues through parturition and lactation (Reijnders, 1980 and Cockcroft et al., 1989). Cockcroft et al. found that up to 80 percent of such residues could be lost after a first pregnancy in bottlenose dolphins. It is, therefore, important that reproductive tracts be collected and examined if tissues are retained for contaminant analysis.

Perhaps it is a sad commentary on the state of the marine environment that levels of organochlorines may be used as a tool to determine stock discreteness in the same manner as information on stomach contents and parasites. Because contaminant levels in prey species vary by geographic location, levels of contaminants may be used in determining separation of populations. One study of harbor seals in Puget Sound found higher levels of such contaminants in animals from the southern portion of the Sound (Calambokidis, 1984). A study on bottlenose dolphins off the coast of South Africa also found differences in contaminant levels depending on the geographic location (Cockcroft et al., 1989). In a study done on west coast harbor porpoises, it was suggested that ratios between compounds may be a more accurate method of making such determinations than absolute levels of contaminants (Calambokidis, 1986).

RECOMMENDATIONS

1. The reporting forms for strandings should be standardized. The NMFS Central Office should work together with each of the Regions and other individuals such as representatives of the Marine Mammal Commission and the Smithsonian Institution to establish a single reporting form which requests the same information in each Region. More complete instructions on recording the data should be provided.

2. A national data base on pinniped strandings should be created. Baseline data on such strandings are inaccessible at the current time.

3. Each Region should attempt to quantify response rates and identify representative areas with complete coverage which can be used as index areas.

4. In conjunction with either a scientific meeting or the next national stranding workshop, NMFS should ask for a review of the definition of Levels A, B, and C data to determine if the existing definition should be changed or supplemented in light of advances in scientific knowledge.

5. Because of its importance for both management and enforcement activities, evidence of human interactions should be moved up to Level A data in all Regions and should be included on the reporting form. NMFS should provide instructions on the recording and detection of such interactions. As an example of an instruction which may be warranted, if an animal is wrapped in a net, samples of the netting material should be forwarded to the Regional Office. As an example of information that might be useful, the Northeast Region has developed a catalog of line, net, and gear types. An effort should be made to provide training programs for detection of interactions in each of the regions. Such a training program could include the preparation of a videotape which could be widely distributed to Network members.

6. Although of a lower priority, the preparation of a necropsy guide covering both cetaceans and pinnipeds would be useful for some members of the Networks. Again, consideration might be given to the production of a videotape. Such a guide/videotape might also be useful to academic institutions.

7. A generic protocol on tissue collection, handling, and preservation needs to be developed and distributed to Network members. The protocol needs to address what tissues can be collected at various stages of decomposition and how they should be collected and stored. The protocol should be appropriate for field conditions and should cover things such as equipment requirements. Those members who maintain collections or tissue banks should be encouraged to meet professional curation standards.

8. A regulation should be promulgated covering the handling of tissues from marine mammals. If a member of the Network retains parts from a stranded animal, they should

be registered with NMFS. The requirement should apply to both hard and soft parts. Although it is charged with regulating both scientific research on marine mammals and enforcing a prohibition on commercial use of marine mammal parts, NMFS currently has no idea where the majority of marine mammal tissues are from stranded animals. The process should be set up so that it is not burdensome to Network members. The system currently used in the Northwest Region where the respondent merely fills in a blank on the stranding report form if parts are retained would be sufficient. A general description such as "carcass" would fulfill the registration requirement. A unique number should be assigned by the NMFS Regional Office to every animal. The number could be the field collection number or the acquisition number. The number should be permanently affixed to all hard parts and to the containers of soft parts. Not only would such a requirement reduce enforcement problems, but it is consistent with accepted curation standards. The regulation should clarify the authority of Network members to transfer tissues to researchers, museum collections, and educational institutions and have procedures for notification of such transfers.

9. A policy statement should be issued clarifying the relationship between scientific research permits and materials from marine mammal strandings. Because questions of jurisdiction at the site of a stranding could inhibit operation of the Networks if permits were to be granted to individuals who are not on the Network, the existing procedure of not processing permits requesting materials from strandings and referring such requests to the Regional coordinators should be retained. Because of confusion over the policy, however, a formal policy statement should be prepared.

10. An effort should be made periodically to identify information from stranded animals which would be useful for the agency's management responsibilities. An effort should be made to contact other components of NMFS such as the laboratories and those with responsibility for fisheries to determine if there is information which could be useful to them. As an example, a toxicologist working in the Beaufort Laboratory has indicated an interest in using marine mammals to monitor levels of pollutants. In order to collect baseline information on presumably healthy animals, an effort should be made to retain as many animals as possible which are incidentally caught in fisheries.

11. In order to determine the utility of tissues from stranded animals and tissues which have been archived, two controlled studies need to be conducted. The first of these would be a study to determine the distribution of chemical compounds in various organs. The objective of such a study would be to determine if the tissue collection site will influence test results. The second study would be a degradation study to determine how time after death affects chemical constituents in various tissues. Many of the animals which strand are in varying states of decomposition, and a determination as to the extent such animals can be used for tissue collection is necessary. Until such time as the studies are completed, an aura of uncertainty will hang over studies utilizing tissues from stranded animals. The studies should be conducted using commonly stranded animals, e.g., Tursiops truncatus and Phoca vitulina.

12. NMFS has initiated a national marine mammal tissue banking program using tissues collected under a rigorous protocol from marine mammals which have been killed incidental to fishing operations. In order to determine whether pollutants are having an impact on specific marine mammal populations, information is needed on contaminant levels in presumably healthy animals. The tissue bank will serve as a means of doing retrospective analysis. If the pilot project being conducted currently is successful, NMFS should expand the concept to include a broader range of species from a number of different geographical areas. Although it is costly, a subsample of the tissues should be tested and made available to the research community. If such tests are run and made available, it may reduce the demand for a very limited resource.

COSTS AND FINANCES

Given the voluntary nature of the Networks, it is virtually impossible to determine the cost of operation. If it were to be replaced by a program operated and funded by the Federal Government, it would cost several million dollars at a minimum. The amount of time and other resources donated by volunteers and institutions in responding to strandings and rehabilitating stranded animals is incalculable.

Because of the differences in types of strandings and the success of Network members in convincing people outside the Networks to donate services, it is difficult to make other calculations. A response to a mass stranding is much more expensive than to a single stranding. If an animal is alive and is rehabilitated, the costs rise geometrically compared to a minimal response for a dead stranded animal. If a trucking company provides transportation of a whale carcass, several thousand dollars may be saved. If a landfill allows carcasses to be disposed of without cost or the Coast Guard tows a carcass out to sea, potential costs are not incurred by either Network members, the responsible local authorities, or NMFS.

Beyond the significant but nebulous cost involving personnel, the members of the Network incur a variety of real expenses. These expenses may vary depending on how active a Network member is and whether the person does anything beyond collecting the minimum Level A data. Every stranding response requires expenditures on transportation. Some institutions have dedicated vehicles for response and rescue or carcass removal. There are also equipment costs. Some of these costs are not readily apparent. As an example, some institutions maintain a beeper system so that someone can be contacted at any time. Photographs are really the minimum voucher specimens. There may be costs involved in the disposal of carcasses. Although it is not mandatory, many Network members collect, prepare and store tissue samples, and it has been unstated policy to encourage such activities. In order to rehabilitate animals, there must be a physical facility. Rehabilitation also requires more capital equipment for rescue and transportation of animals. There are food, diagnostic, and treatment costs during rehabilitation.

There are some cost estimates and budget figures which give an idea of the magnitude of expenditures involved. The Southeast Stranding Network coordinator estimates that excluding personnel costs and rehabilitation costs, it would cost about $250,000 to fund the Network. It should be noted that some of those expenditures would be for capital expenditures which would not necessarily have to be repeated, e.g., strategically placed freezers for tissue preservation (D. Odell, pers. comm., 1989). Several institutions graciously provided financial data on the investment in strandings. It should be noted, however, that such figures are not always comparable. In some cases, salaries and equipment which are part of the institution's normal operations are not included. The New England Aquarium annually budgets $50,000 for stranding activities. The person responsible for their program cautioned that the figure was really a minimum and that the Aquarium was very good about funding additional costs (G. Early, pers. comm., 1989). Mote Marine Laboratory which covers a portion of the west coast of Florida spent $50,000 over a 2-year period. The cost total does not include 10 volunteers, some of which have medical backgrounds and help with laboratory work (G. Patton, pers. comm., 1989). The California Marine Mammal Center which is extensively engaged in the rehabilitation of pinnipeds has an annual budget of $800,000. The Executive Director estimates that they also receive $1,200,000 in voluntary labor and in-kind contributions (P. Barrett, pers. comm., 1989).

Because the nature of strandings differs and because the amount of information collected varies, it is also difficult to calculate a cost per stranding. Mote Marine Laboratory

estimates that it costs roughly $1,000 per stranding and much more if it is a live stranding. It should be noted, however, that they do much more than collect just Level A data. They make an effort to perform a complete necropsy if the carcass is not severely decomposed and collect tissues (G. Patton, pers. comm., 1989). One individual has estimated that if samples are taken, the collection and preparation of tissue samples costs approximately $50 per sample (R. Jones, pers. comm., 1989). The Northeast Stranding Network coordinator stated that the cost of responding to a stranding can vary from fifty to several thousand dollars. There are a couple of generalizations which can be made, however. Mass strandings are more expensive than individual strandings and any effort to rehabilitate a live animal markedly increases the cost.

Mass strandings inevitably require more personnel and more equipment for a response. They represent an opportunity to gain a great deal of information about the life history of a species, though (See St. Aubin and Geraci, and Odell et al., in Geraci and St. Aubin, 1979; Mead et al., 1980; and Sergeant et al., 1980). The cost of a rescue operation for a mass stranding can be prohibitive. Although much of the equipment and personnel were provided at no cost, it cost the Government of West Australia $50,000 to mount a rescue operation for a mass stranding of pseudorcas (Whiteside, 1988). Efforts to collect life histories can also be expensive. The Southeast Stranding Network coordinator estimates that it costs approximately $10-15,000 just to get people and equipment to a mass stranding and to collect and preserve samples (D. Odell, pers. comm., 1989). Analysis of tissues raises the cost significantly. The principal investigator stated that an investigation resulting from a mass stranding of 150 Atlantic whitesided dolphins cost $27,000 in 1974 and would probably cost $50-70,000 today (J. Geraci, pers. comm., 1989).

Some of the major expenses for Network members are related to the treatment of live stranded animals. As indicated above, the majority of the California Marine Mammal Center's expenses involve the rescue and rehabilitation of live stranded animals. The rehabilitation and release of three pilot whales cost the New England Aquarium $80,000 and necessitated a special fundraising appeal (G. Early, pers. comm., 1989). Even holding an animal for a short period of time can result in significant expenditures. The Dolphin Research Center rescued a sperm whale calf which survived less than 3 weeks. During that period, the Center incurred additional costs of $9,000.

Although some Network members have been able to use their Network activities to help generate funds, participation does represent a financial drain. Within the last year, four different facilities have expressed concern that the cost of participation may require them to curtail their activities. The Northeast Stranding Network coordinator suggested that the ability to bear the financial cost of Network participation be one of the criteria for Network membership (T. McKenzie, pers. comm., 1989). It should be noted that the structure of the Northeast Network differs from others. Such a requirement might reduce the opportunity to collect the minimum data that is relatively inexpensive. At times, the cost factor may be exacerbated when NMFS requests individuals to respond to strandings outside of their normal coverage area.

There are a number of methods which have been used to finance the activities of the Networks. Some of the larger and more active institutions provide a stranding budget within the context of their annual operating budget. A couple of organizations receive State funding for their operations. The Texas Marine Mammal Stranding Network has received some support from the Sea Grant program that paid for the printing of stationery, brochures and posters. In addition, Sea Grant provided $10,000 which was used for a graduate student assistantship. The Texas Network has also set up a non-profit foundation to receive funds from the general public (R. Tarpley, pers. comm., 1989). There are rehabilitation facilities that are also almost exclusively supported by contributions from the general public.

Large-scale contributions from the general public are often a direct function of the number of live stranded animals. Even though the animal did not survive, the Texas Network raised $10,000 after a live sperm whale stranding (R. Tarpley, pers. comm., 1989). Because there are smaller numbers of stranded cetaceans and efforts to rehabilitate them have been less successful than in the case of pinnipeds, establishing a secure funding base through rehabilitation is more difficult in areas where pinnipeds do not strand. Several individuals expressed regret that it was difficult to raise funds for the important task of research that could result from dead stranded animals.

A number of suggestions have been made as to activities that should be funded. Surprisingly, the greatest amount of disagreement was over the issue of whether responses themselves should be funded. At one extreme, some members of the Networks argued that if NMFS wanted to obtain reliable data, it would have to fund responses. As an example, one individual commented:

> "If NOAA-NMFS truly wishes to improve marine mammal stranding data, they simply must financially support the system. Because of the nature of the original organization, the volunteer system gives spotty coverage limited to areas of interest and a reduced quality of recordkeeping" (R. Jones, pers. comm., 1989).

At the opposite extreme, some members expressed strong opposition to providing funding for responses. A member of the Northeast Network stated:

> "NMFS should not provide funding for anything other than emergencies. People should enter the Network with their eyes open and the realization that there will be costs related to participation. Providing funding would be the first step down a slippery slope. It would generate more demand for funding. NMFS could not possibly hope to provide the funding necessary for the entire Network" (S. Sadove, pers. comm., 1989).

Another individual expressed concern that the provision of funds could create new problems. He expressed a fear that some groups might use it as a means of gaining a funding base and competition might develop. He expressed concern that it would be more difficult to limit membership to competent people (T. Gornall, pers. comm. 1989).

There has been a number of other suggestions. Some of them have been discussed above, e.g., species identification guides and tissue collection protocols. In some areas, provision of basic equipment could increase both the accuracy of stranding reports and provide encouragement for working beyond Level A data. If an effort is made to develop index areas, it will be necessary to provide funds to determine coverage and response rates. Without index areas, the use of stranding data for management purposes will continue to be limited.

One of the members of the Southwest Network suggested that funding be provided for annual Network meetings (J. Heyning, pers. comm. 1989). In some areas, the Networks could be much more effective if there was a training program. In the case of meetings which are currently held, the individuals most likely to attend are those which are well funded and need less in the way of training. Just as important is training for those agencies that report strandings that are not covered by Network members such as beachfront agencies or marine patrols. Without total coverage, their reports supplement the data provided by specialists. An improvement in reporting of basic data could be partially achieved with the production of a basic videotape that could be widely distributed. Videotapes have the disadvantage that the information is limited to what is presented. There is no opportunity to ask questions or for experts to expand on a point.

Several individuals have suggested that a computer bulletin board be set up. The uses of such a means of communication would be to move filing of reports closer to real time, to let people know of the availability of tissues, and to transmit protocols and other information to Network members. It has been pointed out that many members currently have the equipment which would enable them to communicate through such a Network.

It has also been pointed out that a consistent public relations effort will require expenditures. The topic of publicity generally will be discussed below. However, in this context, it should be mentioned that publicity will help in the first stage of stranding responses, i.e., getting word to members of the Networks when an animal is observed on the beach, and contribute to more complete coverage. Publicity efforts can also help those organizations that are dependent on donations to raise funds so that they can continue Stranding Network activities.

Because stranding events are not predictable, it is difficult to determine what activities will require NMFS participation in any year or what research will contribute to meeting management responsibilities. Without a funded stranding budget, the Regions are limited in their ability to either provide services to the Networks or to cover important strandings. A participant in the Northwest Network stated that there should be a small budget available to the Regional Office. He emphasized that no attempt should be made to cover all expenses, but funds should be available for things such as laboratory work (M. Johnson, pers. comm., 1989). The Stranding Network coordinator for the Northeast Region was more blunt. She stated:

> "There is a need for a contingency fund for responding to unusual strandings, and we need a stranding budget if NMFS expects to improve the level of data collection and the level of effort within the Networks. The Regions should be given the budget and the contingency fund" (T. McKenzie, pers. comm., 1989).

Johnson also spoke of a need for a second type of contingency fund. He said that a fund should be available for response to massive epizootics. A similar observation could be made for environmental catastrophes such as the Exxon Valdez oil spill. When an event such as the east coast bottlenose dolphin die-off occurs, the agency is put into the position of having to respond without having money specifically appropriated within a fiscal year. Such emergency responses entail extensive reprogramming of funds and inevitably affect other programs. Given the nature of such events and the massive commitment involved and uncertainties as to which Region(s) might be affected, any such fund would have to be centrally administered.

RECOMMENDATIONS

1. The very essence of the Marine Mammal Stranding Networks lies in its voluntary composition. If NMFS were to routinely fund stranding response and to provide payment for time and transportation, it would change the nature of the program. The cost of such a change would be prohibitive. NMFS cannot and should not provide funds for basic Network participation. Given the fact that many volunteers do provide a service for the agency, there are support and logistical activities which the agency should provide. The agency should be willing to provide technical advice. Things such as protocols and guides should be produced and readily available. The agency also should be willing to conduct training for Stranding Network members and periodically sponsor workshops where technical information can be shared. To the extent that the agency requests members to collect any information beyond Level A data, the agency should be willing to provide equipment and reimburse members for expenditures for such things as the expenses incurred in tissue preparation. A minimal and continuing investment in the Network is likely to improve Network operations and improve the accuracy of the information gained from strandings.

2. In order to carry out the various support and contingency activities, a small budget should be provided for the Stranding Networks. It is recommended that initially $25,000 per year be provided to each of the Regions in addition to the salary of the Regional stranding coordinator. Because of different needs in the Regions, they should have discretion to determine how to spend the funds subject to three conditions: the funds may only be used for stranding activities; funds should be used to supplement current operations and should not be used for routine stranding responses; and an accounting of the way that the funds are used be provided to the Central Office.

3. Because major die-offs are inherently unpredictable and inevitably require large expenditures that can affect the viability of other programs, a permanent contingency fund to respond to such emergencies should be created. In order to carry such funds from year to year, the agency will have to request specific legislation. Such legislation should not be requested, however, until NMFS develops a plan to respond to such situations. Advance plans need to be in place for the detection of such events, the process whereby a decision is made to initiate an investigation, and the steps necessary to enhance response.

4. Although NMFS should not provide funding for routine stranding responses, there are certain types of strandings where the agency should assume a portion of the costs. If there is a significant stranding where the collection of tissues can contribute significantly to specific information needs, the agency should be willing to pay for the collection, preservation, and shipment of tissues. As an example, significant knowledge which may help in the recovery of the species could be collected from right whale strandings. Similarly, the agency should be willing to assume all or a portion of the expense for certain mass strandings. The amount of money required for a response to such events can severely strain the financial resources of Network members and limit their willingness to continue such activities. In return, the agency should expect that an effort be made to collect as much information as possible on life histories of the animals. Finally, if the agency asks Network members to respond outside of their normal geographic region, it should be willing to reimburse some of the expenses.

5. Arrangements should be made so that funds can be released in an expeditious manner. A stranding response requires immediate action, and it makes little difference if the funds are available a month later. It is recommended that a procedure be worked out with the Department of Commerce whereby funds can be provided on a timely basis. As a possibility, such expenditures may require the approval of both the Regional Director and a financial officer. At best, the current contracting system is unwieldy. It is set up so that there is little accountability. By the time a contract is approved, no one has real responsibility for its approval. The agency should not be afraid to encourage accountability. If something is done right an individual should get credit. If something is done wrong because of misjudgment or other factors, it should be possible to assign blame.

PUBLICITY AND FEEDBACK

Communication can affect the effectiveness of the Stranding Networks. External communication with the general public can influence the possibility of strandings being reported to the Networks. Internal communications can affect the enthusiasm of Network members and their willingness to respond.

Without publicity, members of the general public are less likely to make the initial report which triggers a response. At a second level, unless authorities such as local law enforcement agencies and beach managers are aware of a contact point, response rates may also be reduced. Periodic efforts must be made if response rates are to remain consistent.

The major effort in this area has been made to notify the public each year during the harbor seal pupping season not to remove pups. In each Region where harbor seals are present, an effort has been made to contact the media. The Regional Offices have put out press releases each year. The cooperation of the media has generally been good. In the Northwest Region, posters which were initially prepared by Oregon and Washington Sea Grant programs have also been distributed. They read, "Seal pups rest on shore. Do not disturb them! It's the law. Report animals in distress to the State Patrol." In addition, each of the institutions engaged in the rehabilitation of pinnipeds has made a similar effort.

For the most part, general publicity in terms of Stranding Network activities are left to the individual members of the Networks. NMFS has not made an effort to bring attention to the Networks through its public affairs apparatus. In addition to possibly affecting the receipt of reports, such an effort is particularly important in areas where an attempt is being made to expand or improve coverage.

At the secondary level, the Southwest Region has made an effort to contact beach management agencies and local enforcement agencies periodically. The majority of the effort, however, is conducted by individual Network members. Several members indicated that they make an effort to contact local units of government each year to inform them of the Networks and to give procedures for contacting the Networks. In some areas, individual Network members have developed close working relationships with local authorities.

Because NMFS is unable to fund stranding responses, some of the Stranding Network members depend on funds from the general public. Agency cooperation in drawing attention to the Networks could possibly have two beneficial impacts. First, it would increase the number of strandings that are reported to the Networks. Second, it might help create a more secure funding base for some of the Network participants. One Network member suggested that communications are important enough that funding should be specifically designated. He stated that communication needs to be improved with the general public, property owners, and other governmental agencies (R. Jones, pers. comm., 1989). The Network coordinator in the Northeast also indicated that money for public relations efforts would be likely to improve the ability of the Networks to respond.

To help with publicity and fundraising, several members of the Networks have decided that something more needs to be done. As examples, a number of organizations have prepared their own pamphlets describing the Network's operations and giving instructions as to where a stranding should be reported. Mote Marine Laboratory has distributed booklets giving basic information on marine mammals to boaters in the west central region of Florida. The California Marine Mammal Center and, more recently, the Texas Stranding Network have developed quarterly newsletters for those who provide financial support for

their stranding operations. The Network in Texas also is currently working on a documentary which can be shown on educational television and presented to groups.

There is one communications issue in which the agency probably should take a greater role. More often than not, the media focuses on live strandings and strandings involving large numbers of animals. Comparatively little attention is paid to the scientific value of dead stranded animals. The Network coordinator in the Southeast expressed frustration over the fact that the concentration on live strandings inhibited fundraising in those areas that did not have live pinniped strandings. He stated that an effort needed to be made to emphasize the scientific contributions. He felt that even beach managers need to be notified of the role of science in the Networks. Because of turnover in personnel, it would need to be done on a periodic basis (D. Odell, pers. comm., 1989). One individual indicated that NMFS had previously indicated that it would make an effort to publicize the scientific use of dead stranded animals, but had never followed through on the commitment. He emphasized that such action is important if the agency hopes to achieve fuller coverage of strandings (R. Jones, pers. comm., 1989).

A greater emphasis on the scientific value may help counter a different type of publicity problem. The general public's expectations can, at times, be unrealistically high. One individual pointed out that the general public may view the only purpose of the Networks to be the rescue of marine mammals. There is likely to be an emotional reaction to such situations and a negative reaction if rescue and rehabilitation efforts are not successful. He commented that there needs to be a public education effort explaining the causes of strandings, the fact that they are not uncommon, that animals may very well be in the last throes of an illness, and that the animals can provide important information whether they survive or not (J. Antrim, pers. comm., 1989).

Feedback to the members of the Network is also important. Such actions provide positive reinforcement. One individual pointed out that such feedback tends to make people feel that they are performing an important function and generates enthusiasm, and it will ultimately affect response rates (L. Price, pers. comm., 1989).

Almost universally, Network members indicated a desire for more communication. Feedback to members is limited, however. Both the Northwest and Southwest Regions indicated that they do send out the compilation of cetacean strandings prepared by the Smithsonian Institution. Despite the fact that pinniped strandings are common in both Regions, there is no similar report on pinniped strandings. The lack of such a report might possibly be interpreted to mean that NMFS considers pinnipeds to be less important and reduce the response rate for pinniped strandings. The Southeast Region also distributes the Smithsonian report, and the Network coordinator prepares a quarterly report of strandings in the Region which contains tables which indicate the magnitude of stranding events and the species involved by individual states. One of the coordinators indicated that he would like to prepare a quarterly newsletter to Network members but just does not have the time.

The lack of feedback has created the perception among some of the Network members that their activities are not appreciated by NMFS. One individual commented that the amount of work that has been done gratis has never been acknowledged. He stated that a thank you had never been received for his facility's work. Another member of a Network put it even more strongly, "(The practice) of not thanking participants for services rendered seems inexcusable." Thanking people for help should extend beyond just the members of the Network. Often, someone outside of the Network will donate equipment or services. If an acknowledgment of their assistance is received, they are more likely to help in the future.

If Network members were to be informed of the scientific information that has been gained from stranded animals, their activities could be reinforced. Several individuals

indicated that it would be useful if Network members were apprised of the significance of the data which they collect and the studies conducted utilizing tissues from stranded animals. A significant amount of scientific literature has resulted from studies on stranded animals and their tissues. The realization of non-scientist members that they are contributing to the body of scientific knowledge could help generate enthusiasm. In this respect, it would be useful to explain to enforcement personnel or beach management agencies such things as how reproductive tracts can contribute to our knowledge of population dynamics or what can be learned from stomach contents. When queried as to whether they would be willing to provide non-technical abstracts of publications resulting from strandings, there was no consensus among scientist members of the Networks. Some stated that it could be done readily, and they would be willing to do so. Others indicated a hesitancy to engage in additional work.

The director of the Texas Network had an interesting observation. He commented that people like getting tangible things to remind them that the Network is something that is real. In Texas, the Sierra Club donated copies of their cetacean taxonomy guide at cost to the Network. The Network distributed the copies to its members at cost. There are any number of things which could serve a dual purpose by being both tangible and improving the capabilities of the Networks. As indicated above, Network operations could be improved in some places by providing species identification guides, protocols for collection of tissues, and necropsy instructions. Sporadically in the past, handbooks have been prepared, but usually they went out of print fairly quickly. Some very good material was prepared, e.g., the NOAA Technical Report that was an identification guide to cetacean species (Leatherwood et al., 1982), but the utility of such material is limited unless a commitment is made to print such materials on a continuing basis.

RECOMMENDATIONS

1. Network coordinators should make a systematic effort to identify state resource agencies, enforcement agencies likely to be contacted when there is a stranding, and agencies with jurisdiction and conservation responsibilities over shoreline areas. Because local government structure varies from state to state, the appropriate officials may be different in each state. The task should include efforts to contact, where appropriate, officials of the National Park Service, the Fish and Wildlife Service, and military bases. All such agencies should be contacted annually to explain the Networks and procedures for contacting Network members when there is a stranding.

2. Public affairs offices in the Regions should cooperate with attempts to publicize activities of the Networks. They should not be leery of publicizing the efforts of individual Network members when it is appropriate. With the help of Regional coordinators and the central office, an effort should be made to emphasize the scientific information which can be generated from strandings and how that information can be applied for conservation purposes.

3. Stranding Network coordinators should ask Network members to contact them when someone outside the Networks has provided help in a response to a stranding situation. The Network coordinator should then make sure that the individual receives a letter of appreciation.

4. Network members should be asked to provide a list of scientific publications resulting from work with stranded animals. This list should be compiled nationally and a bibliography should be distributed to all network members. This list should be updated periodically, and to the extent that members cooperate, non-technical abstracts of new publications should be distributed.

5. The Regions should seek opportunities for feedback to the Networks. If NMFS wants to operate effective volunteer Networks, they must be nurtured. A demonstrated indication of interest is likely to generate enthusiasm and affect response rates.

6. NMFS should prepare technical publications for use by the Networks on a continuing basis. The publications should include such things as species identification guides, protocols, and other materials to help make the Networks more effective. In the past, materials which have been printed have quickly gone out of print. An effort should be made to continue distribution so that new members of the Networks receive such materials. NMFS should also consider the possibility of developing videotapes which can be widely distributed that could provide instruction on various levels. The Marine Mammal Commission and Minerals Management Service are currently working on two videotapes dealing with basic response and identification of human interactions. NMFS should determine how well such tapes are received. If the method holds promise, NMFS should consider developing a videotape on necropsy techniques.

ENTANGLEMENT AND OUT-OF-HABITAT SITUATIONS

There are events involving distressed marine mammals which do not technically qualify as strandings but are perceived as such by the public. They often generate considerable publicity, and, at times, NMFS has been criticized for a lack of an expeditious response. Such events seem to fall into two generic categories--animals which are out of their natural habitat and animals which are entangled. In both instances, the marine mammals can be freely swimming but severely distressed.

The first category includes animals which stray up rivers, e.g., the humpback whale in the Sacramento River, or are in areas which might otherwise be natural habitats at different times of the year, e.g., the bottlenose dolphin which remained near Virginia Beach, Virginia, when the rest of the stock had migrated south.

The second category primarily consists of whales which have been entangled in fishing gear or other marine debris. At the present time, the majority of such reports are limited to humpback, fin, right, and minke whales in the northeast and gray whales in the southwest. In part, this must be attributed to the proximity to the coast with a greater chance of being observed at specific times of the year, i.e., during the feeding season in the northeast and during the migratory season for gray whales. They are not exclusive either to species or region, however. Recently, a sperm whale estimated to be 40 feet in length was successfully freed from swordfish longline gear off the Atlantic coast of Florida.

Although there is a tendency to limit such activities to large whales, potentially they could include small cetaceans and pinnipeds. Although less likely to survive encounters with nets, there have been reports of small cetaceans swimming with ropes and buoys attached to their tail stocks. NMFS has also received a proposal to disentangle pinnipeds on rookeries on the west coast.

The welfare of animals in such situations may be threatened. As indicated above, authority to take action for the welfare of an individual animal is provided by § 109(h)(1) of the MMPA. Humpback, fin, gray, and right whales are also listed as endangered under the Endangered Species Act (ESA). Section 7(a) of the Endangered Species Act provides, "The Secretary shall review other programs administered by him and utilize such programs in furtherance of the purposes of this Act." Particularly in the case of the Northwest Atlantic stock of right whales whose condition is so precarious that the loss of a single healthy individual could be significant, actions to rescue whales would be consistent with the goals and purposes of the ESA. The agency has not established a policy on how such situations will be addressed, however.

Currently, out-of-natural-habitat situations are addressed on an ad hoc basis. There is no established system for dealing with such situations, and they have sometimes escalated to mini-crises over such questions as who has the authority to deal with them. There are those who have commented that such situations are natural and that there is no good biological reason to intervene. Such a course may not be viable, however, because of the level of public concern. As one individual put it in another context, "NMFS cannot ignore public opinion. We are public servants and an essential element of serving the public is responding to their concerns." (Pers. comm. Richard Ferrero, 1989). (The author would probably be a little bit less diplomatic in expressing these sentiments. Although certain biases were mentioned in the introduction, perhaps another should be added. An agency ignores public opinion at its own peril. Furthermore, there is a certain arrogance in telling the public, "We know what should concern you." Inevitably, such an attitude seems to erode

public support. As discussed above, far more could be done to use such activities to expand the public's knowledge beyond the immediate circumstances of such an event. Certainly, a perception that the agency does not care will not help the agency attain its more general conservation goals.)

By not responding, the agency may contribute to an additional complication. Seeing no response, well-meaning individuals may take it upon themselves to rescue an animal despite a lack of training. This could result in injury to the animal or to the individual. While such an attempt could be subject to enforcement action as an unauthorized take, prosecution of an individual attempting to rescue an animal when the agency has opted to do nothing itself would seem to be ill advised.

Out-of-natural-habitat situations are inherently unpredictable--even more so than stranding situations. While it is impossible to predict when or where and what type of situations will develop, it can be predicted with certainty that they will occur. If at all possible, the confusion in response should be minimized. Even if a non-response option is appropriate, the method of reaching a determination should be regularized. The public should be promptly notified of all decisions and the reasons for them.

In the case of disentangling whales, a rescue attempt probably involves a "take" of the animal even if the intention is benign. The definition of "take" in § 3(11) of the MMPA includes harassment. The ESA contains more inclusive language in § 3(18). In addition to harassment, the definition includes harming or pursuing. An unsuccessful rescue operation could further stress or injure an animal. There is also the possibility of serious injury to those engaged in such an operation. In at least two instances rescuers themselves have become entangled in nets.

Currently, the agency has no explicit policy on how to deal with free swimming, entangled marine mammals. Such events occur with greater regularity than those in the first category. Each year, between 10 and 20 whales on the east coast and between 15 and 20 gray whales on the west coast are reported as entangled. Because of actions initiated by individuals and groups, however, informal recognition of such activities has taken place in the Northeast and Southwest Regions.

At a minimum, the informal policies amount to selective non-enforcement of the provisions of the MMPA and ESA. Because the policy has been set at a regional level, there is inconsistency in regional responses and actions. While the Southwest has chosen not to take legal action in such situations, two individuals told of an event in the Northwest when an unauthorized group responded to what appeared to be an entangled whale, and the threat of an arrest was made. The animal was a basking shark, and no action was taken.

The Northeast Region has been aware for several years that certain groups have rescued whales and given its tacit consent. Several humpback whales are disentangled each year. There have also been cases of untrained individuals attempting to disentangle whales. It has been reported that three such attempts were mishandled and unsuccessful last summer.

In the Southwest Region, a more conscious policy is in place. There was at least an informal legal opinion developed that such activities are not prohibited by the Acts. One individual said that legal counsel had advised them that no "take" occurred because the "take" had taken place when the animal initially became entangled. The author was unable to confirm that such a written legal opinion exists. Although it is a pragmatic means of dealing with a problem, such a policy could have unintended implications. Beyond the question of whether such actions could harm a whale if unsuccessful, the prohibitions on taking extend to parts of marine mammals. If the law were to be interpreted so that no take could occur beyond an initial take, it would be impossible to regulate possession of parts.

The Southwest Region has granted at least informal recognition to units which rescue whales. Four groups have entangled whale reports referred to them by the NMFS Southwest Regional Office. The referrals are made on the basis of assigned geographic regions. There is at least one other group which has conducted activities on its own. An individual from one of the groups indicated that there could be a dispute as to who was in charge of a rescue operation and that such a dispute could hamper a rescue operation if there were no cooperation. The groups have put out publicity on their activities and each has a hot line. One group has established an 800 number, and another has made special arrangements with the Redondo Beach Marine Operator to pass on reports. The semi-official recognition of the groups is further reinforced by the fact that the Southwest Region has been involved in training sessions on how to conduct rescue operations.

Organizationally, both categories have been treated as an adjunct of stranding activities. In fact, the definition of stranding provided to the Southwest Network conceivably covers out-of-natural-habitat situations already. It reads, "A marine mammal out of its element is considered to be 'stranded'." There is a logic to such an approach. In large part (but not exclusively), those who respond to such situations are also members of Stranding Networks. There are, however, significant differences in the types of events. Rescue of free swimming animals involves different equipment and different skills than rescue of beached animals. At a minimum, a boat and inflatable craft are probably needed. Due to the possibility of rough seas, those handling the craft should have a minimum level of proficiency. If a capture is the appropriate response for an out-of-natural-habitat situation, netting is required. If the individual does not have skill in using the nets, the attempt could very well be unsuccessful, resulting in further stress to the animal. In the case of entanglement events, equipment such as buoys, extra lines and wet suits may be required.

As is pointed out above, membership in the Stranding Networks varies considerably. Although it would be possible to add additional authority for selected groups under Letters of Authorization, a segregation of functions might be advantageous. Particularly in the case of disentangling whales, the level of danger is sufficient that a rigorous set of criteria for those who volunteer is advisable. If it is treated as a higher level for members of the Stranding Networks, there may be an incentive for unqualified members to apply for the additional "benefit." There is an all too human tendency to approve applications unless there is organized opposition. It certainly creates less difficulty for an official to approve an application than to endure the inevitable friction which develops when an application is rejected. Approval of unqualified respondents would not be consistent with the safety of either humans or the marine mammal.

The need for a policy decision in this area is far from academic. In 1991, NMFS received an application for a scientific research permit to disentangle whales from the Center for Coastal Studies. The Center had been involved in rescuing whales for some time, but one individual indicated that they wanted to make sure that they had clear legal authority for the activity. The Center is not itself a member of the Marine Mammal Stranding Network in the Northeast but operates as a sub-designee under the authority of the New England Aquarium. The Aquarium has no interest in being responsible for disentangling whales. After much discussion, it was decided that such rescue operations did not constitute scientific research, and a decision was made to issue a Letter of Authorization similar to the Letters issued for membership in the Stranding Networks but explicitly for disentangling whales.

OPTIONS

OUT-OF-NATURAL-HABITAT EVENTS

1. Continue to respond on an ad hoc basis.
   Advantages--The number of events is small enough that no special action is warranted. The agency can continue to respond to such events as they occur. Maintaining the flexibility of response outweighs any potential disadvantages.
   Disadvantages--Without clearly developed lines of authority, such events tend to escalate to a high level and require more time than they warrant. Closely related, without a clear locus for decisionmaking, an expeditious response is less likely. The agency has been reactive to such events and been subject to criticism for an often halting approach.
2. Establish a formal policy of non-response to such situations.
   Advantages-- There is little biological justification for such responses. The resources which the agency devotes to such responses are totally out of proportion to their importance. The resources would be more beneficial to the species if they were applied to other conservation programs. By taking an affirmative position, a justification could be prepared in advance which could contribute to public understanding of conservation measures.
   Disadvantages--The agency could lose control of the situation. If the agency takes no action, individuals may take it on themselves to rescue an animal. Should they do so, an enforcement problem could ensue. Further, such unauthorized activities could endanger both the animal and the individual involved. Negative publicity is inevitable. People respond to such situations on an emotional level and even the most rational explanation is unlikely to satisfy them.
3. Develop formal lines of authority and assign responsibility for decisions.
   Advantages--It would regularize the response and enable decisions to be made on a more expeditious basis.
   Disadvantages--It would formally involve the agency in an activity for which no decision as to appropriateness or desirability has been made.
4. Extend the authority of Stranding Network members to include such events.
   Advantages--Those most likely to be used for such an event are already members of the Networks. It would be consistent with one of the goals of the Networks, i.e., the welfare of live marine mammals, and could logically be seen as an extension of current operations to rescue animals on the beach. Such an approach would probably produce the quickest response. It would insulate the agency from public reaction and be less of a drain on resources.
   Disadvantages--Not all Network members have the skill, knowledge, or equipment to allow them to respond to such events. As pointed out above, however, designation of members to respond to specific types of events already exists in some areas. By customizing Letters of Authorization, it would be possible to make sure that only qualified individuals would respond. It would entail major changes in the issuance of Letters of Authority, though. Furthermore, there may be groups who do not wish to assume such authority which could create problems where a single member is designated for a specific geographic area. It removes the decision for ultimate disposition from the agency. It could mean defending decisions which might not have been made if responsibility had been retained by the agency.

DISENTANGLING MARINE MAMMALS

1. Continue existing policy.
   Advantages--The current policy of benign neglect is working fairly well, and any changes would not necessarily improve the effort. If the agency maintains a hands-off approach, it is less likely to be found liable if an injury should occur.
   Disadvantages--The legal authority for current policy is questionable. Takes undoubtedly occur when attempts are made to disentangle animals. Although unlikely, without some sort of authority being delegated, those who mount rescue

operations could be subject to legal action, and inconsistencies are likely to develop between regions. The agency would be unable to set standards which would reduce the danger to both animals and humans. The agency also would be unable to limit respondents to those who are most qualified. There is the potential for disputes over who has responsibility for a specific operation.

2. Extend the existing authority of specific, qualified Stranding Network members to include responding to entanglements.

The advantages and disadvantages are much the same as for option 4 in the first category except that "more of the same" should be added to the disadvantages section. Virtually everyone involved with such rescue attempts seems to be resigned to the fact that inevitably someone will be killed or seriously injured. Furthermore, there are complications where a Stranding Network member has exclusive authority over a section of the coast. Their willingness to retain stranding responsibilities could be compromised if they felt obliged to pay for the equipment and personnel to respond to entanglements. Finally, in any situation where the Federal government grants a "license" for such an activity there is increased vulnerability to liability.

3. Use a separate Letter of Authorization process under § 109(h)(1) and § 112(c).

Advantages--It separates authority for strandings from disentanglement activities. Even more than the Stranding Networks themselves, it would seem to be consistent with the goals of the MMPA and ESA. Prior to the issuance of the Letter to the Center for Coastal Studies, both the Right Whale and Humpback Whale Recovery Teams indicated that such activities would be consistent with recovery efforts. Such a procedure allows the agency to set up conditions and standards and to exercise a degree of control over who responds. It will eliminate questions as to who has authority to respond. There seems to be support for such an approach from those currently involved with disentangling whales. It can generate data on human interactions which could help the agency with its management responsibilities by indicating types of gear entangling animals.

Disadvantages--Such a program could add to the paperwork burden of agency personnel. Even though participants would be volunteers and not solicited, agency participation in such a program could increase the possibility of litigation if an injury were to occur.

RECOMMENDATIONS

1. Adopt option 3 in the case of out-of-natural-habitat situations with the following conditions. Assign the authority for decisions to the NMFS Regional Director. Give the Director the responsibility for assessing the situation, determining an appropriate response, and granting authority for the response to competent individuals.

The Regional Director is likely to be more familiar with such variables as the geography and locally available resources. Furthermore, raising an issue to the national level invariably takes time, putting the agency behind the curve before it even gets started. The Regional Director should have the authority to decide if nothing should be done beyond monitoring, if a rescue operation is called for, or if euthanasia would be the most humane treatment for the animal. He or she should also be given authority to decide who should be involved in a rescue effort if that is determined to be the appropriate action. Such authority could very well extend beyond mobilizing resources for capture and relocation. It could include the choice of an appropriate facility if it is determined that a period of rehabilitation is necessary. Although the recommendation would place responsibility in the Region, there should be a direction that the national office be informed of such situations, the decisions made, and where an animal is placed for rehabilitation.

When public attention is drawn to such an event, the agency cannot avoid being involved. By anticipating such events and setting up a regularized procedure for response, an expeditious response is more probable and decisions are less likely to be influenced by the heat of the moment.

2. Adopt option 3 in the case of disentangling marine mammals. Because of the different nature of the events, it is not appropriate to administer such a program through the Stranding Networks. Because of the danger involved, rigorous criteria need to be established for any group choosing to volunteer for such an activity. A demonstration that those who will be involved in such rescues have received training and have a minimal level of competency should be an absolute prerequisite for any applicant. Further, an applicant should demonstrate that they have the equipment necessary to be successful in such an activity. A condition should be placed in each Letter of Authorization that any rescue attempt must be under the direct supervision of an individual who has been certified as competent by the agency.

To prevent regional differences, the standards for individuals and equipment should be set by the national office. It is recommended that suggestions for such standards be solicited from Dr. Jon Lien of the Memorial University of Newfoundland, who began such a program in 1978 and is recognized for his expertise; the individuals and groups currently engaged in such activities; the Marine Mammal Commission; and the Regional Offices. Although it would not be required in order to issue Letters of Authorization under § 112(c) of the MMPA, both the general proposal and proposed standards should be published in the FEDERAL REGISTER for public review and comment. Once the standards have been set, authority to issue Letters of Authorization should be delegated to the Regional Directors.

As a condition of any Letter, there should be a reporting requirement. Although by no means exhaustive, such a report should include:

a. The date and location of any rescue attempt.

b. The species and numbers of animals involved.

c. Whether or not the rescue attempt was successful. If not successful, an assessment of why it was not. Such a condition is necessary if performance is to be monitored and may be of assistance in refining rescue techniques.

d. Identification of the individual animal if it has previously been catalogued and an assessment of its condition.

e. Accurate identification of the materials entangling the animal. During the most recent reauthorization of the MMPA, NMFS was tasked with the duty of gaining information on marine mammal-fisheries interactions. Gaining information on such things as types of netting (including mesh size) or other gear such as weights, lines, or buoys can supplement the agency's current efforts following the reauthorization.

f. Any injuries to rescue personnel or animals.

There are three other conditions which should be in any Letter. Because of the dangerous nature of the activity, there should be an acknowledgement on the part of the applicant that he or she is aware of potential risks and voluntarily assumes those risks. This should be coupled with a strong waiver of liability provision in the letter itself. Second, such Letters should have a termination date so that the agency will be compelled to evaluate performance periodically. Finally, if at all possible, such animals should be tagged for the purposes of identification if they should subsequently die.

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APPENDIX A

APPENDIX A

National Marine Fisheries Service Regional Offices

National Marine Fisheries Service
Alaska Region
P.O. Box 21668
Juneau, AK 99802-1668

National Marine Fisheries Service
Northeast Region
One Blackburn Drive
Gloucester, MA 01930

National Marine Fisheries Service
Northwest Region
7600 Sand Point Way, N.E.
Seattle, WA 98115-0070

National Marine Fisheries Service
Southeast Region
9450 Koger Blvd.
St. Petersburg, FL 33702

National Marine Fisheries Service
Southwest Region
300 S. Ferry Street
Terminal Island, CA 90731-7415

APPENDIX B

APPENDIX B

Level A Data: Basic Minimum data from all stranding events (to be submitted to the National Office)

1. Investigator - name
   - address (institution)

2. Reporting source

3. Species - preliminary identification (by qualified personnel)
   - voucher (supporting material)

   a) photograph- full lateral view (cetations); dorsal view (pinnipeds); dorsal, lateral, ventral views of whole carcass, with close-up of head (when possible). Include a card with field number in each photo.
   b) specimens- canine tooth or entire mandible (pinnipeds); 2 pieces of midrow baleen, or bulla if baleen is missing (mysticetes), tooth counts and samples, or entire skull for difficult species (odontocetes).

4. Field number

5. Number of Animals - total
   - sub groups (fragmented mass stranding)

6. Location - preliminary description (local designation)
   - latitude and longitude (to .1 minute if possible) with closest names cartographical feature (USGS 1: 250,000 series) as determined subsequently in the lab.

7. Date, time - first discovery
   - of data and specimen recovery

8. Length (girth and weight when possible)
   a) cetaceans and sirenians- tip of rostrum to fluke notch
   b) pinnipeds- tip of rostrum to tip of tail, lying on back

9. Condition - recorded for both discovery and recovery times. Categories are as follows:

   1 - alive
   2 - freshly dead (i.e. edible)
   3 - decomposed, but organs basically intact
   4 - advanced decomposition (i.e. organs not recognizable, carcass intact)
   5 - mummified or skeletal remains only

10. Sex

a) cetaceans - probe genital slit (anteriorly directed are female, posteriorly directed are male)
b) pinnipeds - positions of apertures
c) sirenians

Level B Data: Supplementary onsite information. Augments data on life history and the stranding event.

1. Weather and tide conditions

2. Orientation of carcasses

3. Offshore human/ predator activity

4. Presence of prey species

5. Behavior - pre stranding
- stranding (on beach)
- after return to sea

6. Samples collected for subsequent analysis

A. Age determination
a) odontocetes - 4 to 5 adjacent teeth from the middle of the tooth now.
b) mysticetes - minimum of one ear/plug, preferably **in situ** in a sample of external auditory meatus, or in a glove finger.
c) pinnipeds - minimum of 1 canine tooth - claw
d) sirenians - tusk, where present

B. Reproductive Tracts
a) females - both ovaries, uterus, fetus (if present) and measurements and samples of mammary glands.
b) males - one testicle with epidydimus, or samples with weights and measurements, baculum (when present), and vas deferens.

C. Stomach Contents
a) weigh contents, if possible
b) preserve in alcohol (never in formalin)
c) freeze whole, if possible

7. Disposition of carcass

Level C Data:

1. Necropsy

Precise recording of findings and appropriate preservation of tissue are of great importance to an understanding of disease conditions. The most important characteristics of an abnormality are is **SIZE** and **LOCATION.** Also important are features such as **COLOR, TEXTURE,** and **SHAPE**, as well as the nature of the transition from normal to abnormal tissue, that is whether the boundaries are sharp or vague. All findings are described in **STANDARD ENGLISH** using **NON-TECHNICAL TERMS.** Lesions are described using terms such as raised, flat, depressed, rough, smooth, velvety, warty, yellowish, round, irregular, etc. Photographs should be made whenever possible, and should include a ruler or some other non-ambiguous reference object.

External Examination - Describe all unusual features such as marks, abrasions, parasites; examine mouth and teeth, etc.

Internal Examination - Samples are to be taken routinely from all organs including brain, muscle, endocrine glands and viscera. When an organ is normal, a random section should be preserved in formalin. Any abnormality should be sampled with an adjacent piece of normal tissue. If an organ is studded with many discrete lesions, all apparently identical, sample only two or three. Describe organs as normal appearing, if that is the case. Vessels and ducts are normally opened throughout their length. While this is in theory desirable for the intestine, sampling of two or three tubular sections may be adequate. All major organs are weighed in pieces, and the partial weights added. Hearts are normally weighed with a short cuff of aorta.

Preservation of tissue

Formalin (10% neutral buffered) is the standard fixative. Tissue taken for histology should be fixed in formalin of a volume 20 time the volume of the tissue. Tissues should be slices thin - about 3 mm. Other dimensions are not critical; 3 by 3 cm is a convenient size. Larger pieces of tissue do not fix well.

Whole lesions, e.g. stomach ulcer, may be taken and fixed with good results as the wall of the organ is thin. When possible cysts and cavities in tissue, pus-filled lesions and fluid found in body cavity should be cultured for bacteria. Commercial holding media are excellent for the purpose, and their use is recommended. Special requests for research material such as whole organ preparations should only be honored is accompanied

by detailed protocols.

Collection of Toxicology specimens

Tissue samples collected for pesticide and heavy metal analyses may be wrapped in aluminum foil or places in plastic bags. For prolonged storage, glass containers with teflon-lined lids are recommended. The samples should be frozen as soon as possible, but may be transported on ice without significant loss of residues.

Sample of blubber, brain, liver, kidney, and muscle should be collected routinely. Single assays may be performed with as little as 10-20 grams of tissue, but samples weighing 200 g or more are necessary for a complete spectrum of analyses.

2. Parasite Collection

Parasites may be found anywhere within the body, by problem areas are identified as follows:

Head	- sinuses
	- ears
	- brain
Skin, Blubber	
Muscle, Fascia	
G. I. Tract	- including fecal sample
	- liver, gallbladder, duct
	- pancreas, duct
Respiratory	- major airways (opened)
	- lungs
Uro-genital	- kidneys
	- genital organs
	- ureters, bladder
Blood	- sample or smear

Fixatives

A - Alcohol-Formalin Acetic Acid (AFA)- 40 ml of 70% alcohol, 10 ml of 5% formalin, 2 ml of acetic acid, 48 ml of distilled water.
B - Glycerin-Alcohol - 5 ml of glycerin in 95 ml of 70% alcohol.
C - Potassium Dichromate - 2% aqueous
D - Formalin - 5% solution
E - Ethanol - 70% solution

Sampling Procedures

- subsample when large numbers are present
- do not distort

- ensure collection of head and tail
- sample portion of infected tissue when a parasite reaction is observed. Fix in A when possible
- measure and photograph, if possible

1. Nematodes - fix in hot (16 C, 60 F) fixative B. or place in tap water in cooler for 12 hours, then fix in solution A.

2. Trematodes, Cestodes, Acanthacephalans - place in tap water for 12 hours, then fix in solution A.

3. Lice, Mites, Copepods, Barnacles - fix in either D or E.

4. Stool Sample - preserve in fixative C.

Source: Geraci and St. Aubin, 1979. Biology of Marine Mammals: Insights through Strandings. pages 25-31

APPENDIX C

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
P. O. Box 271, La Jolla, California 92037

Date : August 13, 1973

Reply to Attn. of:

To : F, Robert W. Schoning
Director, National Marine Fisheries Service

From : F, Steven E. Schanes
Assistant to the Director for Special Projects

Subject: Policy on Beached, Stranded, Injured, Ill, Forfeited and Dead Marine Mammals

At your direction on May 22, 1973, I chaired a public hearing on the captioned subject at the Auditorium of the United States Department of Commerce, Washington, D.C. The transcript of the hearing was given wide distribution and extensive comments were received from within and outside of NMFS. In addition, other statements concerning policy and practices were submitted by interested individuals representing private and institutional view points.

Overall, there is considerable agreement concerning both policy and practice with respect to the animals falling in the various categories. These categories are discussed below. Certain general principles emerge:

1. The paramount concern is the welfare of the animal with a major objective being possible return to the wild on a viable basis.

2 The determination of immediate appropriate action should be delegated to local, knowledgeable agencies and persons.

3 The Federal Government should take advantage of and strengthen existing mechanisms which promote this goal.

4. The Federal Government should take the steps necessary to fill in the institutional pieces which are missing.

5. The Federal Government should serve as the focal point for the collection of data and interchange of scientific knowledge.

6. The programs must recognize the realities of existing local conditions.

7. To the extent possible, needs for public display and scientific research should be met by these animals.

8. This program should positively encourage proper care of marine mammals; the Federal role is to enforce this principle.

It appears that the provisions of the Interim Regulations and the operating steps which NMFS has taken are consistent with these principles. Obviously a great deal has to be done to reach a satisfactory level of programs performance. This includes careful consideration of areas of policy disagreement, which may require years of accumulation of knowledge to resolve.

Beach Or Stranded Animals, Whether Or Not Injured Or Ill

It appears valid to assume that any beached or stranded animals is at that point incapable of managing in the wild. A qualified judgement is needed as to the immediate steps to be taken. These may range from transporting the animal to a place where full care can be given to humane dispatch. Protection may be needed from human and animal harrassment. For these situations the Federal Government should ask the states to present action programs which meet the program principles.

In a number of instances, existing state and local activities can already meet this need. Included would be:

(1) the delegation to state and perhaps local enforcement officers of the authority to take control of the animal and to make the initial decisions;

(2) the identification of private and public facilities ("Marine Mammal Rescue Centers") to which would be given responsibility for appropriate care and disposition of live animals;

(3) the disposition of animals which die, safeguarding scientific interests;

(4) prompt notification to a central source of all acquisitions and determinations.

The Federal role would include the following:

(1) approving the state plan, including the facilities qualifications and practices of "Rescue Centers";

(2) establishing a national statistical, medical and scientific information system;

(3) developing research programs concerning the care of marine mammals and all aspects of returning them to the wild;

(4) ensuring that holders of permits to acquire marine mammals first make full use of animals which have been cured.

Among the issues presented were the following:

1. Can injured and ill animals be returned to the wild successfully and under what conditions? Opinion varies. Evidently healthy mammals have been returned "successfully", although there has been no system of checking.

   A number of concerns have been expressed: Are "cured" animals really healthy enough to compete successfully in the wild? Have these animals been so accustomed to man's care that they cannot be self-reliant? Will the animal that has become friendly with man be drawn to fishermen and their gear? Will marine mammals long in captivity transmit human disease with adverse results?

   Evidently some of the answers depend upon the nature of the injury or illness and the age of the animal. However a great deal must be learned before any sound policy can be adopted.

2. Should NMFS play a role in the price for a cured marine mammal which is applied against a permit? This applies to both the "Rescue Center" who may want the animal under a permit and to another public display facility or research institution. I would suggest that at the outset NMFS stay out of this area, while maintaining records so that this policy could be resolved periodically.

3. Should "Rescue Centers" be reimbursed for their costs? There seem to be sufficient tangible and intangible advantages to these institutions so that animals would be accepted and care given without reimbursement. I recommend against payment for these costs.

4. Are there sufficient facilities throughout the country to care for these animals? This may depend on the area, although full statistics are lacking. It is clear that the situation in Alaska is far different from that of other states. These problems will have to be considered as part of each state's plan.

Forfeited Animals

Since the Act entrusts the marine mammals to the Federal Government, NMFS will have to take specific action in the case of abandonment or other violation. Where seizure occurs, the same policy should apply as in the case of beached animals, except that the question of title may exist. If so, ultimate sale of an animal will take place. Prior to that time NMFS should determine whether the animal should be returned to the wild or used to meet a permit quota. Also, prior to that time, there should be no payment by NMFS for care and the "Rescue Center" should have discretion with respect to the use of the animal prior to the sale of title. NMFS should receive a fair market price less the cost of care, which would be credited to, or received by, the Rescue Center.

Dead Animals

It is essential that full scientific value be obtained from each dead animal. This may require depositories to which all or significant parts of the animal will be brought. Dead animals or parts thereof should, as a matter of policy, be given non-profit scientific research or educational institutions as a first priority. I would place in this category, public museums that may wish to stuff an animal for public display. Absent a demand by these non-profit institutions, the animal or parts thereof should be disposed of in any manner that will result in some use before considering burying, incineration or other destruction. While a list of priorities could be established, it may be more prudent to simply leave the disposition with local authorities where they have assumed this role.

APPENDIX D

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Washington, D.C. 20235

JUL 5 1977

F33/LAH

TO: Regional Directors
National Marine Fisheries Service

FROM: Winfred H. Meibohm, Associate Director
National Marine Fisheries Service, F

SUBJECT: Disposition of Living, Stranded Marine Mammals

The disposition of living stranded marine mammals has been a continuing problem since passage of the Marine Mammal Protection Act of 1972. However, a variety of these problems have been resolved satisfactorily by individual Regions and the Washington office and some useful working precedents have been set. These are set forth in general terms in the following paragraphs for information and guidance.

A living stranded marine mammal may be:

1. Humanely euthanized, at the direction of the competent local, State or Federal officials, and under veterinary supervision; and then disposed of as would be a dead stranded animal; or

2. Taken into captivity for rehabilitation, by:

   a. State or local government employees or officials;
   b. Federal agents;
   c. the Holders of valid Federal Permits issued for this purpose; or
   d. any Party to an agreement with NMFS, which is entered into for this purpose.

Following successful rehabilitation of an animal thus brought into captivity, a determination should be made, on the basis of the best available veterinary medical advice, regarding the desirability of returning the animal to the wild. On the basis of this determination the animal may be:

1. Returned to the wild, at the direction of the officials that authorized the taking, in the vicinity of other marine mammals of the same species;

2. Placed into the permanent custody of the Holder of a valid Permit, to be used in lieu of taking an animal as authorized by the Permit; or

3. Placed into the permanent custody of any competent facility.

The placement of a rehabilitated stranded marine mammal into the custody of a Permit Holder, or other competent facilities is within the discretionary responsibility of the NMFS Regional Director of the Region in which the animal was originally taken, subject to determining that the receiving facility can properly maintain the animal, and subject to the concurrence of the receiving facility and, as appropriate, the local or State officials. In this regard, the Regional Director may:

1. Authorize a Permit Holder with a valid Permit to take animals of the same species as the stranded animal, to care for the animal, said animal being thenceforth considered a part of the taking authorized by the Permit;

2. Authorize a facility to care for the animal, said facility holding a Permit to take the same or other species. The stranded animal would not be considered a part of the taking authorized by the Permit, but the facility would be bound to the conditions of the Permit, relative to the animal; (Attachment 1)

3. Enter into an Agreement for the permanent care of the animal, with a non-permit-holding facility, the conditions of such an Agreement being similar to permit conditions (i.e., Attachment 2).

Attachments (2)

APPENDIX E

LETTER OF AGREEMENT BETWEEN

NATIONAL MARINE FISHERIES SERVICE OF THE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

DEPARTMENT OF COMMERCE

AND

MEMBERS OF THE NORTHEAST

MARINE MAMMAL STRANDING NETWORK

(Authority: Marine Mammal Protection Act of 1972 16 U.S.C. 1361 et seq.)

ARTICLE I - General Information:

Pursuant to a delegation of authority, the Assistant Administrator of the National Marine Fisheries (the Service) has authority to administer the Marine Mammal Protection Act of 1972, as amended, (the Act). The Service's responsibility under the Act is limited to those mammals which are members of the Order Cetacea and members, other than walruses, of the Order Pinnipedia (the marine mammals).

is a charitable and educational corporation organized under the laws of the State.

In order to further the purposes of the Act, and to provide for the protection, health and welfare of beached and stranded marine mammals, the Service and deem it necessary and appropriate to enter into this Letter of Agreement (the Agreement).

ARTICLE II - Reference and Authorities:

This Agreement between the Service and is entered into under the authority of section 112(c) of the Act.

ARTICLE III - Purpose:

The parties have entered into this Agreement for the general purpose of ensuring the appropriate care, rehabilitation, disposition, and utilization of beached and stranded marine mammals found along the east coast of the Atlantic Ocean under the jurisdiction of the Service, Northeast Region, and for the following purposes:

1. To provide for the rescue and rehabilitation of sick, injured or distressed marine mammals;
2. To provide for the return to the wild of those reasonably susceptible to such rehabilitation;
3. To define the nature and extent of services that will provide the Service under this Agreement;
4. To provide for preparation and maintenance of records containing scientific data obtained from dead marine mammals; and
5. To provide for timely exchange of information for use by both parties in furthering their respective objectives under this Agreement.

ARTICLE IV - Responsibilities of Parties:

1. Subject to the approval of the Service, qualified representatives will be appointed by who may collect or otherwise take marine mammals pursuant to this Agreement.

2. Representatives of shall notify the Service within 30 days after the taking of any marine mammals, indicating:

   a. Who took the marine mammal;

   b. Date of taking;

   c. Circumstances of taking;

   d. Location of taking;

   e. Species (name, size, condition, etc.);

   f. Any related scientific information contained within the 30-day period; and

   g. Disposition of the marine mammal, and, in the case of a dead marine mammal, field number, catalog number and institution in which the specimen materials have been deposited.

3. agrees that it shall make every reasonable effort to dispose of the carcass of any dead marine mammal collected pursuant to this Agreement, particularly any dead mammal which, in the opinion of the Service, poses a public health hazard or nuisance.

4. Any living marine mammal taken pursuant to this Agreement will be temporarily placed under the care and custody of Such marine mammal will be: a) returned to the wild, upon a determination by the Assistant Administrator or his designee, that the animal is sufficiently rehabilitated so as to be able to survive in the wild; or b) disposed of in such a manner as may be determined by the Assistant

Administrator or his designee. Marine mammals to be released shall be tagged or marked in appropriate manner prior to their release into the wild.

5. shall submit annually to the Service, beginning one year from the date of the Agreement, a report summarizing its activities and findings conducted and made under the Agreement.

6. shall bear any and all expenses connected with the collection, maintenance, release or other activities associated with the marine mammals taken pursuant to this Agreement.

7. agrees that its representatives shall not collect marine mammals without first obtaining the consent to such collection of the appropriate agency of the State in which such mammals are located.

ARTICLE V - Rights of States:

Nothing in this Agreement shall be construed to affect the rights or responsibilities of the States or their employees under the Act with respect to beached or stranded marine mammals.

ARTICLE VI - Review:

Upon the written request of either the Service or , this Agreement may be modified in a manner mutually agreeable to the parties.

ARTICLE VII - Term of the Agreement:

The terms of this Agreement will become effective upon the signature of both the approving officials of the respective parties hereto. This Agreement will remain in effect until terminated upon thirty (30) days written notice by either party.

SAMPLE
(Letter of Authorization)

Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, FL 33702

F/SER23:CAO:td

Name and Address:

Dear :

Under the authority of Section 109 of the Marine Mammal Protection Act, the U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) Southeast Region (SER) authorizes you to assist in the operation of the Marine Mammal Stranding Network as a "participant."

By the terms of this letter and the enclosed General Conditions, you are hereby authorized to:

1. Take live marine mammals only for the purpose of transporting sick or injured individuals to an aquarium or other acceptable facility for treatment of disease or wounds by competent personnel.

2. Take and transport dead beach-stranded or floating dead marine mammals for the purpose of:

a. public health and safety,

b. scientific and/or educational use, and/or

c. disposal at a sanitary landfill or other location determined to be suitable on a case by case basis by the Regional Director, SER.

3. Return live stranded marine mammals to the sea.

4. The taking of measurements of live stranded marine mammals.

5. The taking of measurements and biological samples from dead stranded marine mammals.

This authorization is subject to the General Conditions and is subject to immediate revocation if the terms and conditions of the letter and General Conditions are not met. Should you have any questions regarding this letter of Authorization, please contact our Permit Specialist, Ellie F. Roche, at (813) 893-3366.

Welcome to the Southeast Region Marine Mammal Stranding Network!

Sincerely yours,

Charles A. Oravetz, Chief
Protected Species Management
Branch

Enclosure

cc: Dr. Daniel K. Odell

General Conditions Applicable to Authorized Marine Mammal Stranding Network Participants

CONDITIONS APPLICABLE TO ALL PARTICIPANTS

I. Responsibilities of Authorized Participants:

a. The participant should recognize the necessity to respond quickly (e.g. 24-48 hours) to reports of beached or floating marine mammals and to cooperate with local officials in the expeditious removal of these animals. The participant is expected to assist local officials in the clean-up of beach areas should the actions of necropsy or specimen collection contribute to the soiling of the site.

b. A copy of this Letter of Authorization must be in the possession of the person to which it was issued when:

1. A participant is in the process of taking or collecting stranded marine mammals.

2. A participant is transporting marine mammals for any purpose as authorized by this letter.

3. Any marine mammal or marine mammal parts are in the possession of the participant.

II. Requirements for Taking and Transporting Beached Marine Mammals:

a. All marine mammals must be taken in a humane manner. If the Regional Director, Southeast Region (SER), determines that any method of taking is not humane he shall so notify participants. Taking by such method shall immediately cease and taking shall not resume until an acceptable method of taking has been prescribed by the Regional Director, SER.

b. The participant shall employ a duly certificated common carrier by air, water, rail, or road in the transportation of any marine mammals, except that the participant may use a private vehicle for such transportation if such vehicle is operated by the participant's personnel.

c. Permission must be acquired from the landowner prior to entering the stranding site each time a participant responds to an event.

III. Records and Reports:

a. The participant shall mail stranding data reports within thirty (30) days of collection for all cases to the following individual:

Dr. Daniel K. Odell
Sea World Research Institute
7007 Sea World Drive
Orlando, FL 32821

Phone: (407) 351-3600 Ext. 158

b. The retention of any authorized hard parts (i.e. bones, teeth, etc.) from any beached marine mammal collected under the network shall be reported within 30 days of its collection to the Regional Director, National Marine Fisheries Service, SER, (9450 Koger Boulevard, St. Petersburg, Florida 33702) as required by 50 CFR 216.26. Registration shall include the following:

1. The name of the owner.
2. A description of the article to be registered.
3. The date and location of collection.

(Title to any marine mammal parts collected under this section is not transferable unless consented to in writing by the Secretary of Commerce.)

c. Retained marine mammal hard parts collected through this stranding network shall be permanently marked with the institution's catalog number or any alternative marking system approved by the Regional Director, SER.

IV. Disposition of Retained Marine Mammals and Parts:

a. The participant shall not sell or trade any live animal or parts of a dead animal collected as authorized by this letter.

b. The participant will make every reasonable attempt to notify the scientific community of the availability of specimen materials.

c. Marine mammal parts made of a permanent collection, if specifically authorized in the Letter of Authorization and as prescribed by Section 3.c., of these General Conditions, may be loaned to other scientific and educational institutions, provided the loan is appropriately documented and the loaned parts clearly labeled so as to identify the institution of origin.

V. Inspection:

Upon request by the Regional Director, SER, the participant shall permit any employee(s) of the National Marine Fisheries Service or any other person(s) duly designated by the Regional Director, SER, to inspect the participant's records and facilities that pertain to activities authorized by this letter.

VI. Transferability and Assignability:

The participant shall not transfer or assign this Letter of Authorization to any other person or entity. This Letter of Authorization is of no force and effect if transferred or assigned to any other person or entity.

VII. Amendments:

The provisions of this Letter of Authorization may be amended upon notice by the Regional Director, SER.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
300 South Ferry Street
Terminal Island, California 90731

F/SWR14:JGC

Dear Participant:

Under the authority of Sections 109(h) and 112(c) of the Marine Mammal Protection Act of 1972, as amended (MMPA) 16 U.S.C. 1379(h) and 1382(c), and the Endangered Species Act of 1973, as amended (ESA) 16 U.S.C. 1531 et. seq., the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southwest Region (SWR) authorizes the
to assist in the operation of the California Marine Mammal Stranding Network as a "participant".

By terms of this letter and the enclosed General Conditions you are hereby authorized to:

1. Take live marine mammals for the purposes of:

   a. transporting sick or injured individuals to a State licensed rehabilitation center, or

   b. relocating healthy individuals from a site of heavy human occupation for immediate release, or

   c. treatment and rehabilitation.

2. Take and transport dead beach-stranded or floating dead marine mammals for the purposes of:

   a. public health or safety

   b. transport and temporary holding for authorized scientific and/or educational use, and/or

   c. disposal at a sanitary landfill or other location determined to be suitable on a case by case basis by the Regional Director, SWR.

3. Participate in the collection of stranded marine mammals only along that portion of the California coastline from the to , except in those cases where authorization is requested and approved in advance by the Regional Director, Southwest Region.

4. This authorization is subject to the General Conditions attached and is subject to immediate revocation if the terms and conditions of this letter and attached General Conditions are not met. Should you have any questions regarding this Letter of Authorization, please contact Joseph Cordaro, Network Coordinator, at (213) 514-6665.

Sincerely,

E.C. Fullerton
Regional Director

General Conditions Applicable to Authorized
Marine Mammal Stranding Network Participants

A. CONDITIONS APPLICABLE TO ALL PARTICIPANTS

1. Responsibilities of Authorized Participants:

a. The participant shall be responsible for the activities of any individual who is operating under the authority of the participant relating to the collecting, transporting, or curation of any marine mammals taken pursuant to this Letter of Authorization (LOA).

b. The participant should recognize the necessity to respond quickly (e.g. 24-48 hours) to reports of beached or floating marine mammals and to cooperate with local officials in the expeditious removal of these animals. The participant is expected to assist local officials in the clean-up of beach areas should the actions of necropsy or specimen collection contribute to the soiling of the site.

c. A copy of this Letter of Authorization must be in the possession of the person to which it was issued, or an agent of such person whenever:

(1) A participant is in the process of taking or collecting stranded marine mammals.

(2) A participant is transporting marine mammals for any purpose as authorized by this letter.

(3) Any marine mammal or marine mammal parts are in the possession of the participant of his designated agent.

2. Requirements for Taking and Transporting Beach Marine Mammals

a. All marine mammals must be taken in a humane manner. If the Regional Director, Southwest Region (SWR), determines that any method of taking is not humane he shall so notify participants. Taking by such method shall immediately cease and taking shall not resume until an acceptable method of taking has been prescribed by the Regional Director, SWR.

b. The humane destruction of a marine mammal may be performed by the participant here authorized, provided that participants other than State licensed rehabilitation centers or officials so authorized by 50CFR216.22(a), shall notify the Regional Director, SWR, in writing within seven days of the death and the reason for the euthanasia. If a necropsy is performed on the animal, the participant shall

submit a necropsy report to the Regional Director within 30 days of euthanising the animal.

c. The participant shall employ a duly certificated common carrier by air, water, rail, or road in the transportation of any marine mammals, except that the participant may use a private vehicle for such transportation if such vehicle is operated by the participant's personnel.

d. The hides of beached marine mammals may be sent to registered tanneries for the preparation of scientific specimens for study, provided the Regional Director, SWR, is notified and grants written approval in advance of the temporary transfer. Such correspondence must accompany the hide to and from the tannery. Hides may not be tanned for personal use.

e. Permission must be acquired from the landowner prior to entering the stranding site each time a participant responds to an event.

3. Records and Reports:

a. The participant shall complete a Stranded Marine Mammal Report (sample Enclosure 1) for all cases to which he/she responds. These reports shall be collected by month and submitted together to the National Marine Fisheries Service, Marine Mammal Program, Southwest Region, 300 South Ferry Street, Terminal Island, California, 90731, by the tenth day of each following month.

b. The retention of any authorized hard parts (i.e., bones, teeth, etc.) and pelts from any beached marine mammal collected under this network shall be reported within 30 days of its collection to the Regional Director, National Marine Fisheries Service, SWR, (300 S. Ferry Street, Terminal Island, CA 90731), through the use of the Stranded Marine Mammal Report or the Marine Mammal Parts Registration Form as required by 50 CFR 216.26 (sample enclosure 2)

c. Retained marine mammal hard parts and pelts collected through this stranding network shall be permanently marked with the institutions accession or catalog number or the identifying number issued with the Marine Mammal Parts Registration form described above in Section 3 (b), or any alternative marking system approved by the Regional Director, SWR.

d. All births involving any animal taken under this letter of authorization will be reported via the monthly Stranded Marine Mammal Report form described in Section 3.a above.

4. Disposition of Retained Marine Mammals and Parts:

a. The participant shall not sell or trade any live animal or parts of a dead animal collected as authorized by this letter.

b. The participant will make every reasonable attempt to notify the scientific community of the availability of specimen materials. Such attempts may include (among other things) notification of the Marine Mammal Program (c/o Dr. James Mead), National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, (202) 357-1300. (The submission of monthly stranding reports as required in Section 3.a. of these General Conditions only partially serves to fulfill this requirement.) The participant may contact the Regional Director, SWR, for assistance in this matter at (213) 514-6196.

c. Marine mammal parts made part of a permanent, if specifically authorized in the Letter of Authorization and as prescribed by Section 3.c. of these General Conditions, may be loaned to other scientific and educational institutions, provided the loan is appropriately documented and the loaned parts clearly labeled so as to identify the institution of origin.

5. Inspection

Upon request by the Regional Director, SWR, the participant shall permit any employee(s) of the National Marine Fisheries Service or any other person(s) duly designated by the Regional Director, SWR, and/or California Department of Fish and Game, to inspect the participants records and facilities that pertain to activities authorized by this letter.

6. Transferability and Assignability

The participant shall not transfer or assign this letter of authorization to any other person, as person is defined in Section 3(10) of the MMPA. This letter of authorization is of no force and effect if transferred or assigned to any other person.

7. Amendments

The provisions of this letter of authorization may be amended upon reasonable notice by the Regional Director, SWR.

B. CONDITIONS APPLICABLE ONLY TO REHABILITATION CENTERS

1. The primary intent of the rehabilitation program is to prepare the marine mammal for return to the wild.

2. Rehabilitated marine mammals released back into the wild shall be tagged, marked, or otherwise identified in a manner satisfactory to the Regional Director, SWR prior to release.

3. Rehabilitation centers may recover up to the cost of rehabilitation from an authorized public display facility to which they transfer an animal.

4. Rehabilitated marine mammals that have been determined by a licensed veterinarian to be unfit for return to the wild may be transferred either for public display purposes to a facility that has been inspected and approved by the Department of Agriculture, Animal and Plant Inspection Service and that possesses a NMFS Marine Mammal Permit for Public Display or a NMFS Letter of Agreement, or for research purposes to a scientific research permit holder. Such transfers may be made only after receipt of advance written authorization from the Regional Director, Southwest Region.