

Toni Frohoff, Ph.D.
Marine Mammal Biologist
321 High School Rd. NE, PMB 374
Bainbridge Island, WA 98110 USA
frohoff@earthlink.net

Gilly Griffin, PhD
Director of Guidelines Development
Canadian Council on Animal Care
315-350 Albert St.
Ottawa, Ontario, K1R 1B1 Canada

April 12, 2004

Re: Comments On The First Draft Of “Canadian Council on Animal Care (CCAC) Guidelines On: The Care and Maintenance of Marine Mammals”.

Dear Dr. Griffin,

As requested, I have reviewed the draft “CCAC Guidelines on: The Care and Maintenance of Marine Mammals”. I am submitting these comments on behalf of myself, Zoocheck Canada, and the Whale and Dolphin Conservation Society (WDCS). They have been prepared with the goal of guiding the CCAC towards the refinement of the best possible standards and practices as well as providing useful points of reference for achieving the CCAC’s stated goals.

I point out that submission of these comments does not, in any way, imply that either Zoocheck Canada or WDCS support or condone the capture or captive maintenance of marine mammals for education, research, or entertainment. Both of these organizations are adamantly opposed to the creation and existence of commercial captive facilities and maintain that it is impossible to accommodate the mental, physical and social needs of cetaceans in such facilities. However, if the government goes forward with these guidelines, we believe they need to be improved significantly to provide any value to the care and maintenance of marine mammals in captivity.

I am an independent marine mammal biologist with approximately 20 years of experience studying marine mammals with a specialization in behavioral indicators of stress. I conducted the first study of captive “swim-with-the-dolphin” programs in 1993 in the United States and have been asked to inspect and make recommendations for captive marine mammal facilities by various government and non-government agencies around the world. As a result, I have contributed to the revision and implementation of legislation protecting captive and free-ranging marine mammals in several countries. I appreciate having the opportunity to provide what we hope will be useful comments.

Summary and Overview of Recommendations

We are pleased to see that both United Kingdom and United States marine mammal captivity standards were often referred to in the creation of some of the guidelines in the draft. **However, we were dismayed that some aspects of this document neglected to reflect even a cursory degree of familiarity with current scientific research on this subject or a reasonable level of professional objectivity.** We appreciate that objectivity is often difficult to achieve in these matters. However, this draft was so replete with unabashed and erroneous opinions expressed as fact, that it frequently read more like an advertisement for captive facilities than a professional government document. We are concerned that the welfare of both humans and marine mammals could be placed at an unacceptable level of risk as a result of developing guidelines based on such incorrect and misleading information. It is also troubling to consider that this text might reflect the quality of education that visitors to captive facilities are, and will continue to be, receiving. However, because of your expressed interest in seeking the input of other experts, we have seriously considered every aspect of this document and have provided considerably detailed comments which we hope will be useful to you.

While we do not necessarily agree with all of the points made in Lien's report prepared for the DFO (1999), we appreciated the quality of research that went into it. We recommend that the guidelines be rewritten to consider the research reported in his report as well as the comments that are received by experts such as myself. For example, Lien's report contained many references to enrichment, stress, and well-being in these animals. We recommend that the next draft of these guidelines refer to and incorporate comments from Lien's references on these topics, as well as the important references we refer to in our comments below.

Although we have been somewhat thorough in our review, because of the length of this document and the many errors contained within it, we believe that there are some remaining points that still warrant attention. Therefore, **we would also appreciate having the opportunity to comment on a second draft of these guidelines when it becomes available.**

Overall, we cannot emphasize enough that publishing guidelines in the absence of regulatory legislation and enforcement cannot be considered a reasonable or realistic approach towards achieving reasonably humane animal care standards, let alone "assurance" of "best practices" (a stated goal of the guidelines). **As numerous other countries (such as Italy, Mexico, Brazil, and the United Kingdom) have done, the Canadian government needs to create standards and not just guidelines. Standards would need to be regulated by legislation that includes both the authority and mechanisms for compliance and enforcement.** We believe that to proceed otherwise would be irresponsible and reflect an antiquated approach to animal care policy. In support of this, we point out that Lien concluded that "Absolute *requirements* by the public for maintenance of marine mammals in captivity is that both care and welfare of the captive animals is *assured*" (emphasis added) (p. 2). We also agree with the conclusion of Lien's 1999 report that "... until the deficits which exist in the *practice and regulation* of captive maintenance, there should be a moratorium on captive maintenance of marine mammals in Canada" (emphasis added) (p.2).

Specific Comments

The following are specific comments on the draft guidelines. However, our goal is for this review to serve only as a starting point for an extensive revision of these guidelines and the creation of a much-improved document.

In this review, we refer frequently to United Kingdom and United States (as implemented by APHIS) standards for captive marine mammal maintenance. We also refer to (and recommend following all suggestions specified in) the attached document, “Draft of Proposed Regulations, Submitted on Behalf of The Humane Society of the United States and The Coalition of Animal Welfare Groups” (hereby referred to as the “DPR”) that was submitted to APHIS as part of their negotiated rulemaking meetings (this document contains proposed improvements to APHIS recommendations in bold type). We also refer you to the WDCS comments on APHIS standards (also attached).

Page 5: A. Preface -

1. The goal of the Canadian Council on Animal Care (CCAC) guidelines on: the care and maintenance of marine mammals is to provide expert advice on best practices for the keeping of marine mammals in captivity in Canada.

And

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2. The term ‘best practices’ refers to those practices that are based on a combination of scientific evidence and expert opinion ...

Based on this statement and your solicitation for comments, we anticipate that the “advice on *best practices*” (emphasis added) provided in the final guidelines will **objectively reflect all expert advice** and not favor that submitted by experts affiliated with the captivity industry. We are convinced that only in this way can well-rounded guidelines reflecting best practices be recommended, **since the input of experts with no vested interest in the continuation or expansion of these enterprises is of paramount importance to any non-commercial endeavor or policy.**

Page 5: A. Preface -

1. ... These guidelines are also intended to form the basis for the assessment of facilities holding marine mammals.

And

Page 22: C: Facilities –

101. ... Therefore, they should be used both in the design of new facilities and also in the renovation of existing facilities. These guidelines should be used as standards which existing facilities strive to meet, with the understanding that new facilities or renovations are to be built to meet these standards as needs and budget dictate ...

It has been demonstrated in many countries that for **assessments** to be of any reasonable value, it is imperative for frequent inspections to be conducted regularly by objective, (as well as knowledgeable) persons, who have no vested interest in the continuation or expansion of captive facilities and who are therefore ‘independent’. However, it has also been made evident that without adequate legislative implementation and enforcement of standards, assessments or inspections do not achieve the goals of achieving compliance.

Consequently, it is clear that the Canadian Government needs to create standards that are regulated by legislation that include both mechanisms and authority for a) assessment through inspection and b) enforcement. Regulation and implementation are required and in the absence of these, these “guidelines” cannot be considered a reasonable path towards achieving compliance or towards achieving the stated goals of this document. As Lien observed (1999, p. 45), “DFO, or other regulatory authorities, do not have adequate powers to enforce conditions of captive care and welfare of marine mammals.” Without adequate protocol, authority, and mechanisms for enforcement, guidelines cannot be considered a realistic approach towards achieving “best practices” or even humane standards. We also note that Lien recommended that **“Facilities that now hold marine mammals in Canada should be required to meet all new requirements within three years”** (p. 48) and question whether this, and other recommendations raised in Lien’s report have been seriously considered. In relation to this, we question the addition of the words *“as needs and budget dictate, in order to ensure the availability of facilities necessary to maintain appropriate standards of animal care”*, which threatens to weaken the expectation that these guidelines should be met by all Canadian facilities holding marine mammals and that, above-all, new facilities should only establish if they adhere to them.

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3. The Oceans Act came into force in Canada in 1997. Its goal is the conservation and understanding of oceans and their sustainable use. This is to be accomplished by taking an ecosystem approach, precaution, integrated management and cooperation.

The use of the term **“precaution”**, regardless of whether or not it’s definition in this context is consistent with the “Precautionary Principle” (e.g., Raffensperger and Tickner 1999), has serious implications for limiting or eliminating further capture of cetaceans from the wild. According to this principle, the burden of proof would be on the captive facility to demonstrate that removal of animals from the wild for placement in the facility would not be detrimental to the population or species.

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5. In responding to the report [Lien 1999)], the Minister of DFO accepted recommendations that: permits [that] ... guidelines for the care and maintenance of marine mammals in captivity be developed through the CCAC...

As mentioned previously, we do not believe that these guidelines can be said to adequately respond to the recommendations in Lien’s report since they are, in effect, **only guidelines** and not what was recommended in his report. This recommendation, as well as others in Lien’s report, have not been responded to in the development of these guidelines.

Page 5: A. Preface -

5. In responding to the report, the Minister of DFO accepted recommendations that: permits for the capture of marine mammals in Canadian waters only be granted for the purpose of rehabilitation, research or education ... and educational guidelines for institutions holding

marine mammals in captivity be developed by the Canadian Association of Zoos and Aquariums (CAZA).

And

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8. Marine mammals are currently being held in captivity in Canada. This practice will continue in the near future because many animals have been born in captivity, cannot be completely rehabilitated, or have been in captivity so long that they are unlikely to be successfully reintroduced to the wild.

The prompt release of animals into their natural environment must remain the primary aim of any rehabilitation centre with rescued marine mammals only being brought into such a centre if a veterinarian experienced in dealing with stranded marine mammals determines that an animal would be likely to benefit from a short period of time in captivity, after which it could be released.

A recent meeting of relevant UK veterinary surgeons concluded that rehabilitation in captivity of cetaceans was an inappropriate option for the rescue of these animals in the UK. Instead, animals are subject to a rescue protocol developed over the last 10 years and based on expert assessment at (or close to) the stranding site, which in the case of animals deemed to be viable results in a “refloat”. “Refloat” refers to the return to sea of the stranded animal through a series of carefully planned stages – depending on local conditions. The vets concluded that there was no evidence that refloat is not working and that where euthanasia has been administered, post mortem studies have confirmed, *in all cases*, that the decision was correct.

Zoocheck Canada and WDCS do not believe that marine mammals should be taken into captivity for any length of time for scientific purposes. However, if there are to be provisions allowing for the capture of marine mammals from the wild for **research**, we believe that permits for such capture should clearly demonstrate that such research is a) of direct benefit to the animal(s) or their wild counterparts and b) that animals that are already in captivity are not suitable or available for such purposes. Any research proposal must clearly take into account the impact of the removal of any animal on the wild population and include provisions to return the animal to the wild at the earliest opportunity.

Regarding **education**, we refer the CCAC to Lien’s statement (1999, p. 2) “Absolute requirements by the public for maintenance of marine mammals in captivity is that ... there are educational and scientific benefits which result from keeping such animals.” Regarding the value of education in displaying captive marine mammals, Lien goes on to state that “...lacking is a body of independent empirical studies which shows its impact.”

It does not seem at all prudent for the CAZA to be designated as the sole creator for the development of educational guidelines. A committee should be formed, comprised in part by the CAZA, but also including education experts and marine mammal experts who are not affiliated with captive facilities, so that a reasonably objective and well-rounded set of guidelines can be established. Further, we would recommend that these “guidelines” contain educational *criteria* that all facilities need to meet.

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7. *There are widely diverging opinions in Canadian society on whether marine mammals may be held in captivity. The ongoing societal debate on this matter ...*

It should be noted that the debate on whether marine mammals should be held in captivity is not just within the public sector but this has also been an increasingly controversial topic within the **scientific community** as well.

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8. *... Scientific evidence indicates that marine mammals can be successfully held in captivity under a variety of circumstances.*

It is clearly debatable whether “scientific evidence” indicates that marine mammals can be “successfully” held in captivity. In fact, Rose (2004; p.2) has stated, “In short, the preponderance of hard evidence should lead to the conclusion that captivity and its related practices are ethically *and* scientifically unjustified”. And a recent paper in “Nature” assessed the well-being of 35 species of wide-ranging terrestrial carnivores and determined that “the keeping of naturally wide-ranging large carnivores should be either fundamentally improved or phased out” (Clubb and Mason 2003, p. 473). Since most marine mammals share the traits that the authors used to determine inclusion of species in this study, these recommendations could reasonably be applied to marine mammals as well.

Regarding longevity, the published data have shown that survivorship of captive dolphins has remained below that of free-ranging dolphins. Two of the most recent studies (Small and DeMaster 1995a and Woodley *et al.* 1997) determined that survivorship rates in bottlenose dolphins remained persistently lower than in free-ranging animals (although the differences were no longer statistically significant). Further, these studies observed that captive beluga whales and orcas exhibited statistically higher mortality rates than their wild counterparts (three times higher mortality rate than for orcas in the eastern Pacific).

Although this indicates that dolphin husbandry has improved over the years, it has not done so to the extent that dolphins live longer in captivity. This is reason for caution, considering that one would expect that captive dolphins would live longer because of access to veterinary care, consistent food availability, and protection from natural predators and other threats faced in the wild (Rose 2004). Consequently, the data indicate that the stress of captivity is a significant reason why cetaceans don’t live as long or longer than their wild counterparts. As discussed in detail in various publications (e.g., Mayer 1998; Frohoff 1993, 2000, in Press; St. Aubin and Dierauf 2001; Sweeney 1990), capture and captivity has often been related to physiological and mental stress in cetaceans that has often been associated with behavioral abnormalities, illness, diminished immunological response, and mortality.

Further, most of the facilities examined in these analyses were in the United States where captive standards have been implemented and enforced. Consequently, it could be argued that these facilities are generally better than those that exist in Canada and any perceived successes in this regard may be attributable primarily to these U.S. facilities.

Page 5: A. Preface -

8. *These guidelines are developed to promote adequate assessment of their captive maintenance and justification of any potential future additions to marine mammal collections. In addition, these guidelines are developed to promote the care and use of the animals according to best practices agreed on by experts in marine mammal science for the health and well-being of captive animals where captive maintenance has been considered to be acceptable.*

It is dubious that these guidelines can accurately and fairly state that they have been based upon “**best practices agreed on by experts** in marine mammal science ... where captive maintenance has been considered to be acceptable”. This statement infers that a consensus has been reached by a group of experts representative of the marine mammal scientific community, which certainly is not the case. It also is unclear what is meant by “where captive maintenance has been considered to be acceptable”. Many, if not most, marine mammal experts only consider captivity acceptable under some conditions (such as in conditions consistent with certain humane practices or only for some purposes, such as scientific research) (e.g., Frohoff and Peterson 2003).

Page 7: B. Introduction 1.1 –

16. ... *With the growth of aquariums around the world, people have developed a greater interest in the animals and sensitivity to the ocean habitat they require. Development of methods to photograph and identify individual animals in the wild, motion pictures, TV series, and books which gave names to identified individuals promoted their special characteristics also endeared them to their audience.*

And

Page 8: B. Introduction 1.1 –

19. *With research and captive observation, marine mammal species are now perceived to be highly charismatic, as many exceptional qualities that were not readily obvious in the wild are now better appreciated*

These statements (and similar ones that follow) are presumptuous in that they attribute the public’s “greater interest” in marine mammals and “sensitivity to the ocean habitat” to “growth of aquariums around the world”. **First of all, it has not been scientifically determined to what degree, if any, captive observation is responsible for marine mammals being perceived as “highly charismatic”.** Yet here, and in many other places in the document, other forms of exposure to these animals (e.g., the media) are only mentioned as secondary factors, if at all. There are simply no empirical data supporting these conjectures and opinions, yet they are listed as fact. It could very well be that whatever role that captive display facilities may have had over the years in imparting a beneficial educational/environmental message has plateaued or diminished in light of a more knowledgeable and sensitive public – and because of the positive impacts from myriad other sources of exposure to marine mammals in their natural environment (e.g., media, whale watching). **Further, we note the glaring omission of the positive impact that viewing marine mammals in the wild may have had in this context here and elsewhere in the document (Kellert 1991, 1999; Hoyt 2001, 2002).**

Page 8: B. Introduction 1.1 –

19. ...*Marine mammals tend to be docile toward humans, even in the wild, and develop close and trusting relationships with humans in the captive situation, where they actively seek human attention.*

And

Page 8: B. Introduction 1.1 –

19. ...

In captivity, they [killer whales] have also been found to be docile, intelligent, and readily trained.

We believe that statements that “[m]arine mammals tend to be docile towards humans ... and develop close and trusting relationships with humans in the captive situation” and that orcas in captivity are “docile” are misinformed and naive. Marine mammals are wild animals and are unpredictable, even when trained. Interacting with captive marine mammals poses a true danger to humans. For example, it is not uncommon for people to become injured from swimming with captive dolphins or even interacting with them at the poolside during petting/feeding programs (NMFS 1990; Frohoff 1993; Maas *et al.* 1999; Samuels and Spradlin 1995). Even trainers with extensive experience with the cetaceans with whom they have worked have been seriously injured and, in one case (as described below), even killed by them (Norris 1967; Defran and Pryor 1980). The actual number of injuries suffered by people interacting with captive marine mammals is not known since their occurrence is often not reported. However, existing reports include incidences of broken bones, internal injuries, and serious wounds requiring hospitalization. In addition to the 18 or so injuries documented by the National Marine Fisheries Service in U.S. swim-with-the-dolphin programs within a five year period, I personally witnessed many more injuries than those reported during this time.

One captive orca was associated with the death of a member of the public when he apparently entered the animal’s enclosure without permission (Frohoff and Peterson 2003). On February 20th, 1991, a trainer was killed by captive orcas after she fell into the orca pool at Sealand of the Pacific (now closed) in BC. The coroner's report included a recommendation to develop a regulatory framework for keeping marine mammals in captivity. Also in Canada, in August 2000, an 11-year-old child was bitten by a beluga she was interacting with at a marine park. The injury to her hand required stitches (Ananova, 2000). Injuries and a mortality have also been incurred by people interacting with wild dolphins. In the most serious documented case, a free-ranging bottlenose dolphin in Brazil killed a man and hospitalized another who were abusing the animal (Santos 1997) (many other human injuries have resulted from contact with free ranging marine mammals as well. We would be happy to provide further information on any of the abovementioned incidences as well as details of other incidences we are aware of).

Page 8: B. Introduction 1.1 –

20. ... *Some rescued animals, due to physical debility or bonding with humans, are not satisfactory candidates for return to the wild; these are likely to be retained in the captive environment.*

The statement that such marine mammals are not satisfactory candidates for return to the wild is merely an opinion and should not be stated as if it were fact. In fact, a minimum of three successful **reintroductions** to the wild of bottlenose dolphins have been documented (e.g.,

Wells, 1990; Bassos 1993; Gales and Waples 1993; Balcomb 1994). On two occasions, dolphins held in captivity for several years (and, in one situation, almost two decades) have successfully readapted to the wild even without undergoing a rehabilitation program (Claridge and Balcomb 1993; Balcomb 1994). Cetaceans have also been successfully rehabilitated and returned to the wild following strandings (e.g. Reuters News Service 1999). Although rehabilitation and reintroduction to the wild is still a new and somewhat experimental procedure, it is one that offers the potential for still-unrealized research benefits to conservation and captive breeding practices and should not be so easily dismissed. Further, it can be scientifically argued that maintaining marine mammals in captivity entails its own risks to the animals.

We also point out the following 1991 World Conservation Union (IUCN) Policy Statement: “Reintroduction to the wild should be the ultimate objective of all captive breeding programs”. and Article 9 (ex-situ measures) of the Convention on Biological Diversity, which states that Parties shall adopt measures for the “... rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions”.

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21. ...It is important to recognize the small impact that numbers of animals removed from the wild for captivity have on wild populations or the relatively minor threat captivity poses to the marine mammals, compared to incidental fishing gear entanglements, land and ocean pollution, ocean noise and even whale watching ...

We would strongly argue against the suggestion that captivity poses a “relatively minor threat’ to marine mammals. **The demand for captive dolphins can do far more than harm the individual captured – it can threaten already depleted populations.** In fact, this is why concerns about captive marine mammals have not only been expressed by animal welfare advocates but also by conservationists and population biologists. The capture of even a few animals can result in the death or injury of many more dolphins, since the capture activities involve intensive harassment of a group or groups. In addition, it negatively impacts already depleted dolphin populations by removing breeding (or otherwise important) members from the group. The National Marine Fisheries Service in the United States acknowledges that “The animals removed from the wild for permanent maintenance in captivity often represent only a proportion of the total take [‘take’ being defined under U.S. law as killing, injuring, or harassing] during a live capture operation” (NMFS 1989, p. 33). The capture of numerous orcas from the Southern population of resident orcas in the Pacific Northwest U.S. in the 1960’s and 1970’s, from which the population is still recovering is one dramatic and well-documented example of this (Wiles 2004).

As the IUCN/SSC Cetacean Specialist Group’s 2002-2010 Conservation Action Plan for the World’s Cetaceans states, “Removal of live cetaceans from the wild, for captive display and/or research, is equivalent to incidental or deliberate killing, as the animals brought into captivity (or killed during capture operations) are no longer available to help maintain their natural populations.” “Live-capture activities involving bottlenose dolphins ... have taken place in various countries during recent years without adequate assessment of the wild populations and with little or no public disclosure of the numbers taken” (Reeves *et al.* 2003).

Interactive programs are especially problematic in this regard because female dolphins are typically preferred for these programs (females are typically less aggressive and sexual towards humans than male dolphins). Many studies of wildlife populations (e.g., Oldfield 1988) have demonstrated that removal of females can produce seriously harmful consequences to animal populations over the long term.

Page 9: B. Introduction 1.2 –

24. It is clear that the presence of whale watching boats can interfere with critical life processes in the short-term. When these become repetitive they may result in long-term impacts on some populations.

And

Page 12: B. Introduction 3.3 –

40. ...However, whale watching activities tend to concentrate in areas of critical habitat and major attention may focus on critical sub-groups within populations (Lien 2000). In these cases, the viewing of wild marine mammals has more potential impact on a population than removing a few animals for programs in captivity.

While we support the development of responsible whale watching with the least possible impact on wild populations, we also note the serious impact on marine mammals of removal from the wild for captive display and research (see above). Although negative impacts of whale watching have certainly been documented, numerous well-documented examples exist that indicate that this activity also occurs with minimal impact to the animals under well-regulated circumstances. Moreover, in addition to boosting the economies of coastal communities and providing an economic basis for preserving whale populations, whale watching has also proven beneficial by increasing public awareness of marine mammals and the environmental issues confronting them (Hoyt 2001; Lien 2001). We suggest that the reference to whale watching in the guidelines is both misleading and irrelevant.

We also point out that there does not seem to be mention of the notable opportunities for land-based marine-mammal watching on both coasts of Canada and B.C. I have experienced many of these firsthand and the benefits that these offer should not be overlooked. But again, it is evident that throughout this text, only the negative aspects of whale watching have been emphasized, while opinions regarding the positive aspects of captivity have been elaborated on in great detail.

Page 10: B: Introduction 1.3 –

29. Many species may be taken into short-term captivity for scientific work, such as tagging, or for their rehabilitation. Such animals should remain in captivity for the shortest possible time to assist in ensuring successful release back into the wild.

Capture and transport are inarguably stressful and dangerous for marine mammals.

Physiological indications of stress associated with capture and captivity in cetaceans include elevated adrenocortical hormones (St. Aubin and Geraci 1988; Thompson and Geraci 1986). Small and DeMaster (1995b) found that mortality rates of captured bottlenose dolphins shoot up *six-fold* immediately after capture (and did not drop down to the base captive mortality rate for up to 35-45 days). **Therefore, we do not believe that research involving capture, transport, and confinement in captivity can be conducted humanely.**

Page 14: B: Introduction 3.5.3 -

54. Facility management should ensure that staff are available at all times.

This should specify that the staff should be adequately qualified (according to the DPR, § 3.108 (employees or attendants) and section 12 (staff) of the UK standards.

Page 22: C – Facilities

Overall, for this section on facilities, we strongly recommend that the text of the following sections of the attached DPR be included: § 3.101 (Facilities, general), § 3.102 (Facilities, indoor), § 3.103 (Facilities, outdoor), and § 3.104 Space requirements. We also recommend that UK standards be referred to for each point (see sections 2 through 11) and that the attached WDCS comments on APHIS regulations also be consulted. However, we also have the following specific comments:

Page 23: 1 – Design and Maintenance

And

Page 30: 2.1.4.2 -

The entire section on design and maintenance needs to be revised dramatically to address the needs of various species of marine mammals to the degree that the UK and the U.S. has.

Also, we are aware that the DFO does not include polar bears in their category of marine mammals. However, due to their taxonomic classification as such by many experts and the fact that other countries around the world consider polar bears to be regulated as marine mammals, we recommend that guidelines for them should be included in this document. Specifically, Section 148 in this latter section should be amended extensively to specify the need for shade from the sun that many marine mammals require in warmer weather in outdoor enclosures.

Page 30: 2.1.4.2 -

150. The amount of ice formation acceptable on pool surfaces depends on the species of marine mammal in the pool, as well as the amount of open water remaining, and this must be monitored.

Ice formation standards should be amended to match UK standards (see below) or those based on U.S. standards (see attached DPR):

DRP: §3.103 Facilities, outdoor.

(1) The water surface of pools in all outdoor enclosures housing polar bears and ice or cold water dwelling species of pinnipeds shall be kept sufficiently free of solid ice to allow for entry and exit of the animals.

(2) The water surface of [all] pools in outdoor primary enclosures housing cetaceans and sea otters shall be kept free of ice.

(3) No sirenian or warm water dwelling species of pinnipeds or cetaceans shall be housed in outdoor pools where water temperature cannot be maintained within the [ir normal, natural] temperature range needed to prevent discomfort[, as listed in Table ___].

UK: (2) Construction

(b) Open-air accommodation : Open-air pools must always be ice-free.

Page 30: 2.1.4.3 –

Guideline 18: Marine mammals should be housed in facilities that provide salinity ranges appropriate for the species.

151. The best practice is to keep most marine mammals in salt water of appropriate salinity, unless the veterinarian recommends otherwise (i.e. for medical reasons or rehabilitation), and the salinity ranges should be approved by the veterinarian.

Regarding **salinity**, we recommend that standards match those of the UK:

(10) The Aquatic Environment

(c) Salinity : For marine species, salt content of the pool water must be maintained near the average normally encountered by the species in the wild, and in any case within the upper region of the range 1.5-3.5%.

Page 28: 2.1 -

The guidelines in this section on **water quality** are not specific or exhaustive enough regarding bacteria and other aspects of water quality and should be amended to include the UK (see immediately below) and the attached DRP specifications (§ 3.106) based on U.S. standards (but, at an absolute minimum, include APHIS specifications that “Water quality samples shall be taken and tested at least weekly for coliform count and at least daily for pH and any chemical additives (e.g. chlorine and copper) that are added to the water to maintain water quality standards.”

UK: (11) The Aquatic Environment

(a) General : The pools shall not contain water which would be detrimental to the health of the animals contained therein. The coliform bacteria content of the pool must not exceed 100 MPN (most probable number) per 100ml of water. Should the count exceed this level, the condition must be corrected immediately.

The levels of fungi and other pathogens, as well as of nitrogenous compounds, in pools must be low. Should higher levels be observed, the condition must be corrected immediately. When the water is chemically treated, the chemicals shall be added so as not to cause harm or discomfort to the animals.

Page 29: 2.1.4.1 -

145. ... In untreated salt water systems, marine mammals can be held safely over a range of pH values from 6.5 to 8.5. However, in general it is recommended that pH be maintained between pH 7.2 and 7.8.

We question the discrepancy between this recommendation for **pH** and that of UK regulations:

(11) The Aquatic Environment

(b) pH : The pH of pool water must be maintained within the range 7.6-8.0, with a normal guide level of 7.8.

Page 30: 2.2 –

The guidelines in this section on **air quality** are not stringent enough. We recommend that this be amended per UK guidelines (as opposed to recommendations to “*minimize .. the accumulation of fumes and noxious odors*” (emphasis added) in section 154) as follows:

UK: (2) Construction

(c) Indoor accommodation :

Measures must be taken to ensure that there are no fumes from water treatment chemicals or other sources, or strong odours.

Page 31: 3 –

We found the section on **emergency plans and safety features** to be lacking. For example, we recommend that the DPR (see § 3.101) and both UK regulations (below) be included:

And

Page 32: 3.3

Regarding this section on **security and access**, facilities should also be required to provide marine mammals protection from objects that may possibly be thrown at the animals or inside their enclosures through sufficient distancing or space as recommended in the DPR. We also recommend that the guidelines include the following from the UK:

UK: (3) Water, Power and Fuel Supply and Emergencies

(a) Supply of water, power and fuel must be reliable and sufficient to maintain the conditions, including safe storage of food, necessary for the animals welfare in all circumstances; including readily available alternative provisions for emergencies.

(b) Alternative emergency accommodation must be arranged in advance, and with the approval of the relevant authorities, to which animals can be taken in the event of total failure of equipment, pools or other emergencies. Any emergency moves must be notified to the relevant authorities, in advance if possible, but in any case at the earliest practicable opportunity.

(c) Establishments must have advance plans to cope with any foreseeable problems, including industrial disputes and financial difficulties, which might put the animals at risk.

UK: (2) Construction

(d) Cetaceans shall be protected from harassment, including excessive noise.

Recreational swimming with the animals may only be permitted on specific veterinary advice related to the persons concerned, and with adequate insurance cover for this activity. Cetacean pools will be reserved for the cetaceans and not normally used for any other purpose.

In accordance with Italy's standards for the maintenance of dolphins in captivity and in light of the evidence on the risks associated with contact with captive marine mammals, we recommend a prohibition on public swimming with marine mammals.

Page 24: 1.2

We commend your attention to minimizing excessive or harmful **underwater noise**. It is my understanding that there has been discussion within APHIS to improve U.S. standards in this regard (B. Kohn, APHIS, personal communication, 2003). Since captive cetaceans spend so much of the time near or at the water's surface, we also recommend that provisions for minimizing above water noise also be provided. This would include excessively loud music and poolside noise from the audience during shows. We refer you to the text from § 3.101 in the DPR on this topic as well.

Page 24-26: 1.3 -

117. ... Sufficient space, both horizontally and vertically, must be provided so that the animal can make normal postural and social adjustments with adequate freedom of movement in or out of the water. The species-specific needs of the animal are an important factor in dictating the size and architecture of the pool in terms of providing for physical, psychological and behavioral well-being. In-house experience, as well as the experiences of other institutions, should be taken into consideration in order to determine the best designs for meeting the needs of each species.

We found this section on spatial requirements of enclosures to be entirely and dangerously vague and inadequate for all species of marine mammals. It is neither reasonable or realistic to count on facility owners and staff of all facilities to determine “*sufficient space*”, “*normal postural and social adjustments*”, and “*adequate freedom of movement*” (emphasis added in all cases), and the ability of dolphins to escape dominant tank-mates (*e.g.*, Waples and Gales 2002), with objectivity and sufficient knowledge of current research. We refer you to the comments and calculations specified in the attached DPR and those submitted by the WDCS to APHIS for cetacean minimum space requirements on this issue. For non-cetaceans, we refer you to the attached DPR for APHIS as well as UK standards (specifically; (8) Staff Requirements) on this issue.

Page 26: 1.3 -

Guideline 6: In addition to a pool of water, pinnipeds and sea otters should have permanent and appropriate access to a haul-out or social activity area.

Polar bears were, as mentioned above, completely omitted from this important feature in this guideline which was a glaring oversight. The term “appropriate” needs to be quantified and better defined (for example, such **haul-out and social areas** should also be readily accessible to pups and cubs). **Please refer to, and consider incorporation of, the relatively extensive and quantified specifications for non-cetaceans in APHIS’s section on space with our suggested amendments in the DPR (§3.104).**

Page 31: 2.3

We found this section on **lighting** to be deficient. We recommend incorporating both the following standards from the U.S. and the UK:

UK: (2) Construction

(c) Indoor accommodation : Lighting must be adequate for routine health and hygiene checks and for cleaning. Artificial light should be in a spectrum as close as possible to that of sunlight and the intensity must not be such as to cause discomfort or distress. Light and dark must be supplied for periods, in accordance with the seasonal variations of the natural photoperiod.

APHIS §3.102 Facilities, indoor.

(c) Lighting. Indoor housing facilities for marine mammals shall have ample lighting, by natural or artificial means, or both, of a quality, distribution, and duration which is appropriate for the species involved. Sufficient lighting must be available to provide uniformly distributed illumination which is adequate to permit routine inspections, observations, and cleaning of all

parts of the primary enclosure including any den areas. The lighting shall be designed so as to prevent overexposure of the marine mammals contained therein to excessive illumination. (Lighting intensity and duration must be consistent with the general well-being and comfort of the animal involved. When possible, it should approximate the lighting conditions encountered by the animal in its natural environment. At no time shall the lighting be such that it will cause the animal discomfort or trauma.)

Page 32: 3.3 –

Security and protection from unwanted people or animals does not seem to be adequately provided for in this section. We recommend, at a minimum, the following U.S. standards with the following additions to this section from the DPR (attached).

APHIS: §3.101 Facilities, general.

(a) Construction requirements. (1) ...Lagoon and similar natural seawater facilities must maintain effective barrier fences extending above the high tide water level, or other appropriate measures, on all sides of the enclosure not contained by dry land to fulfill the requirements of this section.

(2) All marine mammals must be provided with protection from abuse and harassment by the viewing public by the use of a sufficient number of uniformed or readily identifiable employees or attendants to supervise the viewing public, or by physical barriers, such as fences, walls, glass partitions, or distance, or any combination of these.

DPR § 3.101 a): “Fences or net barriers must not be such that the marine mammals in the enclosure can become entangled in or be injured by those barriers. Gates or any other dividers used to separate areas of an enclosure or pool must be constructed so that they have no protrusions that could injure or entrap marine mammals, be of sufficient strength to hold the separated animals adequately without cracking, splintering, or breaking, and be constructed so that they may not accidentally be opened or closed.] Lagoon and similar natural sea water facilities must maintain barrier fences on all sides of the enclosure not contained by dry land, with fencing extending at least three feet above the high tide water level.”

Page 33: E –

For this section on transportation, we recommend supplementing this section with text on **handling and transportation standards** as specified sections 15 and 16 of the UK regulations as well as in the attached DPR, § 3.112 through § 3.118.

Page 36: F –

For this section on **husbandry**, we suggest incorporating the text from the DPR from § 3.105 (feeding), § 3.106 (water quality), and § 3.107 (sanitation).

Page 37: I –

Identification of animals should include specifications detailed by APHIS such as: §3.110 Veterinary care.

(d) Individual animal medical records must be kept and made available for APHIS inspection.

These medical records must include at least the following information:

(1) Animal identification/name, a physical description, including any identifying markings, scars, etc., age, and sex; and

(2) Physical examination information, including but not limited to length, weight, physical examination results by body system, identification of all medical and physical problems with proposed plan of action, all diagnostic test results, and documentation of treatment.

Page 38: 3 through 3.2 -

Specifications for **quarantine and isolation** should also include § 3.109 (Separation [Companionship, and Isolation]) from the DPR and section 13 from UK standards.

Page 41: 4.2 -

Regarding release and reintroduction to the wild (please see our comments on this above).

Page 43: 5 -

Regarding **feeding**, we support the guidelines proposed in section § 3.105 (feeding) of the DPR and section 9 (Food and Feeding) in the UK regulations.

Page 49: 7.3 -

We strongly recommend stipulating that young should never be removed from their dams until they have reached the average age for which it has been determined that they separate from them in the wild (if at all, as in the case of most resident orcas in the Pacific Northwest of the U.S and B.C. waters.).

Page 52: 9 -

Recordkeeping should be consistent with the recommendations specified throughout the DPR and in section 12 (Recordkeeping and publication) of the UK regulations.

Page 53: 10 -

Our **staffing** recommendations are as specified in the DPR, § 3.108 (employees or attendants) and section 12 (staff) of the UK standards.

Page 55: G -

We refer you to our recommendations on **veterinary care** in the DPR (§ 3.110) as well as section 14 on this topic in the UK regulations.

Page 63: 2 -

For training recommendations, we refer you to the comments made throughout the DPR on this topic as well as the section on training under section 10 of the UK standards.

Training of marine mammals shall be done by or under the direct supervision of experienced trainers employing operant conditioning training techniques without physical punishment or abuse being used or inflicted upon the marine mammals. Operant conditioning training techniques involve eliciting the desired behavior by use of rewards that reinforce the appropriate response. It involves the use of positive reinforcement without negative reinforcement.

Page 64: 2 -

As discussed earlier, serious concerns exist regarding public contact with marine mammals with respect to the safety of both humans and marine mammals. **We believe that there has been sufficient scientific evidence in regard to both of these concerns to conclude that such public contact with marine mammals should be prohibited. Regardless, if interactive programs with marine mammals are to exist, we strongly recommend that stringent standards be created and that all experts who have conducted these studies be contacted for input at the beginning of this process.**

The entire section ‘Public Contact with Captive Marine Mammals’ (excerpts below) is not based upon any empirical evidence of which we are aware. The lack of such evidence in formulating guidelines for public contact with captive marine mammals is, in our opinion, irresponsible. We have previously mentioned various publications that outline the dangers inherent in human-marine mammal interaction. However, we have not already mentioned the risks of disease transmission (e.g., NMFS 1990; Geraci and Ridgeway 1991) in interaction between the public and captive marine mammals and note that these risks have also been overlooked in the drafting of these guidelines.

Page 64-65: 2 -

367. ... For some, their most memorable contact with animals will come through visits to facilities that hold captive animals.

It should not be ignored that physical contact with marine mammals can also be memorable for people in terms of their having negative and dangerous experiences. As the research shows, it is not uncommon for captive marine mammals to exhibit aggressive and sexual behaviors towards people. Further, visitors have also expressed that viewing – or having contact with - marine mammals in captivity is sometimes a disturbing experience for them because of their concerns for the animals living in unnatural conditions (e.g., Kellert 1991;1999).

368. Touching is known to be an important and basic type of contact in developing relationships. It may be one particularly powerful way in which learning and valuing is established. This can be particularly important, and can have life-long impacts, for some audiences, especially children.

It is our belief that because of the dangers of interacting with marine mammals, children should be the last ones to interact with them. It could be said that touching tigers, bears, sharks, elephants, and other wild animals (in captivity or otherwise) also provides uniquely memorable experiences, yet doing so has been shown to be dangerous and inadvisable. Please refer to the references listed above in our earlier discussion about this to see that there is empirical evidence on which we base these statements.

369. Programs involving direct contact with marine mammals, primarily with some cetacean species, have become common in many places. These may involve swimming with the animals or touching them. Such contacts may involve particular risks to both animals and humans. Contact may be warranted if there are unique benefits that cannot be achieved in other ways.

The authors need to be aware of, and specify here, that there does not appear to be any peer-reviewed research demonstrating that interaction with dolphins is *any* more therapeutic than interaction with domestic animals. Dolphin-assisted therapy is highly controversial in the scientific community. Perhaps it is only more lucrative and glamorous than therapy involving domestic animals. Given the risks to human and dolphin participants, many researchers question the justifiability of dolphin-assisted therapy and have written critiques of claims made about these programs (e.g., Marino and Lilienfeld 1998). Dr. Betsy Smith, a founder of dolphin-assisted therapy, said, “*People would never throw their child in with a strange dog, but they’ll throw them in with a strange dolphin. What you are looking at are vulnerable people and vulnerable dolphins*” (Smith 2003). Ironically, she has chosen to discontinue therapy using dolphins and now only works with and teaches about domestic animals.

Guideline 75: Any direct public contact with captive marine mammals must assure the health and well-being of the animals involved.

Guideline 76: Public contact programs must assure the safety of both animals and the public.

Assurances of health and well-being of the safety of marine mammals and humans simply cannot be made where direct contact is involved, and to state that this can be accomplished is simply misleading (even for facilities offering these programs that have been considered the ‘best’ (e.g., Samuels and Spradlin 1995).

Further, there is also reason to believe that providing the public with opportunities to touch or feed marine mammals can result in harassment and dangerous behavior towards wild populations. As Trevor Spradlin of the National Marine Fisheries Service points out, “There is growing concern that feeding pools, swim programs, and other types of interactive experiences with marine mammals in captive display facilities may perpetuate the problem of the public feeding and harassment of marine mammals in the wild ..” (Frohoff 2003, p. 67).

Guideline 77: Programs involving direct public contact with marine mammals must include systematic evaluation programs to examine short- and long-term costs and benefits of direct contact.

As we would argue that the facilities and program staff themselves may not in a position to conduct such research objectively, we strongly suggest that such ‘systematic evaluation programs’ involve independent experts.

373. At present, there is inadequate information gathered through scientific, systematic studies of such direct contact programs to evaluate either the costs and benefits to the animals, or the costs and benefits to humans.

Only three studies of captive swim programs have been published and one study of petting/feeding pools has been conducted and they all indicate that these programs are not humane for dolphins. My study, which was conducted at one facility in the United States, found that captive dolphins directed behaviors towards swimmers that were related to stress and

aggression (Frohoff 1993; Frohoff and Packard 1995). Another study conducted at four facilities in the United States observed similar high risk behaviors and found that captive dolphins frequently behaved submissively to swimmers even when the swimmers were small in stature, minimally mobile, and did not behave aggressively (Samuels and Spradlin 1995). These studies both observed obvious stress-related behaviors in dolphins that were related to potentially long-term negative physiological effects. We also note that these studies were carried out in U.S. facilities which are often considered to be superior to those found elsewhere in the world.

Recently, a study on captive swim programs in New Zealand observed that dolphins spent significantly more time in a “refuge” area where human swimmers were prohibited during swim programs than during times in which there were no swimmers in the enclosure (Kyngdon et al. 2002). This indicates that the dolphins may have been actively avoiding swimmers. Consequently, all of the studies conducted of these programs observed various stress-related behaviors indicating that these programs may have both short- and long-term negative effects on the participating dolphins.

The WDCS has conducted extensive research on petting/feeding programs and the main conclusion was that the welfare of cetaceans (as well as humans) is seriously compromised in these programs (please see page 10 of the attached WDCS comments and Maas 1999). As a result, WDCS recommended that all interactive programs involving the feeding of captive marine mammals be prohibited. WDCS believes that the non-voluntary (i.e. food motivated) participation of a captive cetacean in a petting pool, the compromised nutritional intake and the increased risk of disease transmission and physical injury, constitutes unacceptable abuse and harassment, as well as presenting an impossible regulatory scenario. We note that Italian standards prohibit the feeding and swimming (any physical contact) with captive dolphins by the public, and the Brazilian standards prohibit the feeding of captive dolphins by the public as well.

In conclusion, on behalf of myself, Zoocheck Canada, and the Whale and Dolphin Conservation Society, I appreciate the opportunity to comment on these guidelines. Please feel free to contact me if there are questions or requests for additional information.

Sincerely,

Toni Frohoff, Ph.D.

Cc: Julie Woodyer, Zoocheck Canada
Cathy Williamson, WDCS

Literature Cited

- Ananova. 2000. Whale bites child. http://www.ananova.com/news/story/sm_28591.html
- Balcomb, K. 1994. Cetacean Releases. Center for Whale Research.
- Bassos, M.K. 1993. A behavioral assessment of the reintroduction of two bottlenose dolphins. Master's thesis, University of California, Santa Cruz, California.
- Claridge, D.E. and Balcomb, C. 1993. In search of marine mammals. *Bahamas Naturalist* 7(1):11-17.
- Clubb, R. and Mason, R. 2003. Captivity effects on wide-ranging carnivores. *Nature* 425(2):473-474).
- Defran, R. H. and Pryor, K. 1980. The behavior and training of cetaceans in captivity. Pages 319-364 in: *Cetacean behavior: Mechanisms and Functions* (L. Herman, ed.). John Wiley and Sons, New York.
- Frohoff, T.G. 1993. Behavior of Captive Bottlenose Dolphins (*Tursiops truncatus*) and Humans During Controlled In-Water Interactions. Master's thesis, Texas A&M University, College Station, Texas.
- Frohoff, T.G. 2000. Behavioral Indicators of Stress in Odontocetes During Interactions with Humans: A Preliminary Review and Discussion. International Whaling Commission Scientific Committee, SC/52/WW2.
- Frohoff, T.G. and Peterson (eds.) 2003. *Between Species*. Sierra Club Books; San Francisco, California.
- Frohoff, T.G. In press. Stress in Dolphins. In: *Encyclopedia of Animal Behavior* (Marc Bekoff, ed.). Greenwood Publishing Group, New York.
- Gales, N. and Waples, K. 1993. The rehabilitation and release of bottlenose dolphins from Atlantis Marine Park, Western Australia. *Aquatic Mammals*: 19(2):49-59.
- Geraci, J. R. and Ridgway, S. H. 1991. On disease transmission between cetaceans and humans. *Marine Mammal Science*, 7.2: 191-193.
- Hoyt, E. 2001. Whale watching 2001: worldwide tourism numbers, expenditures, and expanding socioeconomic benefits. International Fund for Animal Welfare, Yarmouth, Massachusetts.
- Hoyt, E. 2002. Whale watching. Pages 1305-1310 in *Encyclopedia of Marine Mammals* (W. F. Perrin, B. Würsig, and J. G. M. Thewissen, eds.). Academic Press: San Francisco, California.

Kellert, S. 1991. Canadian Perceptions of Marine Mammal Conservation and Management in the Northwest Atlantic. Technical Report No. 91-04. International Marine Mammal Association, Guelph, Ontario.

Kellert, S. 1999. American Perceptions of Marine Mammals and their Management. The Humane Society of the United States, Washington, DC.

Kyngdon, D.J., Minot, E.O., Stafford, K.J. 2002. Behavioural responses of captive common dolphins *Delphinus delphis* to a 'Swim-with-Dolphin' programme. Applied Animal Behaviour Science, 81(2): 163-170.

Lien, J. 1999. A Review of Live-Capture and Captivity of Marine Mammals in Canada. Report prepared for The Department of Fisheries and Oceans, Ottawa, Canada.

Lien, J. 2001. The conservation basis for the regulation of whale watching in Canada by the Department of Fisheries and Oceans: a precautionary approach. Canadian Technical Report of Fisheries and Aquatic Sciences 2363:1-38.

Maas, B., Fisher, S., Williamson, C. Stark, and Simmonds, M. 1999. Behavioral patterns exhibited by captive dolphins at feeding/petting facilities. Pages 111-112 in: Abstracts of the 13th Biennial Conference on the Biology of Marine Mammals, Maui, Hawaii.

Marino, L. and Lilienfeld, S. 1998. Dolphin-Assisted Therapy: Flawed Data, Flawed Conclusions. Anthrozoos: 11(4).

Mayer, S. 1998. A Review of the Scientific Justifications for Maintaining Cetaceans in Captivity. A Report for the Whale and Dolphin Conservation Society, UK.

National Marine Fisheries Service. 1989. Permit Policies and Procedures for Scientific Research and Public Display under the Marine Mammal Protection Act and the Endangered Species Act: A Discussion Paper. Office of Protected Resources and Habitat Program, Silver Spring, MD.

National Marine Fisheries Service. 1990. A final environmental impact statement on the use of marine mammals in "swim-with-the-dolphin" programs. Office of Protected Resources, Silver Spring, Maryland.

Norris, K.S. 1967. Aggressive behavior in Cetacea. Pages 225-241 in: C.D. Clemente and D.B. Lindsley (eds.) Aggression and Defense: Natural Mechanisms. University of California Press: Berkeley.

Oldfield, M. 1988. Threatened mammals affected by human exploitation of the female-offspring bond. Conservation Biology 2.3:260-274.

Raffensperger, C. and Tickner, J. (eds.) 1999. Protecting Public Health and the Environment: Implementing the Precautionary Principle. Island Press, Washington, D.C.

Reeves, R.R., Smith, B.D., Crespo, E.A. and Notarbartolo di Sciara, G. 2003. Dolphins, Whales and Porpoises. 2002-2010 Conservation Action for the World's Cetaceans. IUCN/SSC Cetacean Specialist Group, IUCN, Switzerland and UK.

Reuters News Service. 1999. Rehabilitated pilot whales in prime spot to thrive. <http://www.planetark.org/dailynewsstory.cfm?newsid=4578>

Rose, N.A. 2004. Captive cetaceans: The science behind the ethics. Unpublished document presented at the European Cetacean Society 18th Annual Conference, Kolmarden, Sweden, 29 March.

Samuels, A. and Spradlin, T. 1995. Quantitative behavioral study of bottlenose dolphins in swim-with-the-dolphin programs in the United States. *Marine Mammal Science* 11:520-44.

Smith, B. 2003. The discovery and development of dolphin-assisted therapy. Pages 239-248 in: *Between Species: A Celebration of the Dolphin-Human Bond* in Frohoff, T. and Peterson, B. (eds.). Sierra Club Books, Berkeley, California.

Santos, M.C. O. 1997. Lone sociable bottlenose dolphin in Brazil: Human fatality and management. *Marine Mammal Science* 13(2):355-346.

Small, R. and DeMaster, D.P. 1995a. Survival of five species of captive marine mammals. *Marine Mammal Science* 11:209-226.

Small, R. and DeMaster, D.P. 1995b. Acclimation to captivity: a quantitative estimate based on survival of bottlenose dolphins and California sea lions. *Marine Mammal Science* 11:510-519.

St. Aubin, D.J. and Dierauf, L.A. 2001. Stress and marine mammals. Pages 253-271 in: *CRC Handbook of Marine Mammal Medicine*. pp. 253-271. L.A. Dierauf and F.M.D. Gulland (eds.). CRC Press, New York and London.

St. Aubin, D.J. and Geraci, J.R. 1988. Capture and handling stress suppresses circulating levels of thyroxine (T4) and Triiodothyronine (T3) in beluga whales, *Delphinapterus leucas*. *Physiological Zoology* 61(1):170-175.

Sweeney, J. C. 1990. Marine mammal behavioral diagnostics. In: Pages 53-72 in: *CRC Handbook of Marine Mammal Medicine: Health, Disease, and Rehabilitation*.(L. A. Dierauf, (ed.) CRC Press, Boston, Massachusetts.

Thompson, C.A. and Geraci, J.R. 1986. Cortisol, aldosterone, and leucocytes in the stress response of bottlenose dolphins, *Tursiops truncatus*. *Canadian Journal of Fisheries and Aquatic Science* 43:1010-1016.

Wells, R.S., Scott, M.D. 1990. Estimating bottlenose dolphin population parameters from individual identification and capture-release techniques. *Reports of the International Whaling Commission, Special Issue* 12, 407-415.

Wiles, G. J. 2004. Washington State status report for the killer whale. Washington Department Fish and Wildlife, Olympia.

Woodley, T.H., Hannah, J.L., and Lavigne, D.M. 1997. A comparison of survival rates for captive and free-ranging bottlenose dolphins (*Tursiops truncatus*), killer whales (*Orcinus orca*) and beluga whales (*Delphinapterus leucas*). IMMA Technical Report No. 97-02.