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Scribner, Lorna C., "The Debate on Marine Mammals in Captivity" (2012). *Honors Theses*. 62.
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THE DEBATE ON MARINE MAMMALS IN CAPTIVITY
2012

BY

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Interdisciplinary Studies: Ethology & Anthrozoology

Submitted in Partial Fulfillment of the
Requirements for the Degree of Bachelor of Science
In the Honors Program at
Coastal Carolina University

December 2012

Background

Marine mammals play important roles within ocean ecosystems and environments and add to the vitality of trophic systems. These species populate almost every marine habitat including tropical oceans, estuaries, rivers, rocky coastlines, and icy shelves (Katona et al. 1988). They occupy various trophic levels, from apex predators to first-level consumers and eat everything from plankton to other marine mammals. Many species have populations ranging in the millions, such as *Lobodon carcinophagus* the crabeater seal, which consumes tons of prey a year (Plötz et al. 2001). This mass consumption has obvious effects on the Antarctic ecosystem, and is just one of the many examples of a marine mammal's effect on a food web. Cetaceans, a specific order of carnivorous mammals including whales, dolphins, and porpoises, alone influence a variety of other marine organisms including seabirds, invertebrates, fishes, and even parasites. Marine mammals make up a large fraction of the biomass of the oceans, and their survival is critical to the health of ocean ecosystems.

Some major problems causing concern over marine mammal populations include whaling, commercial fishing, habitat loss and degradation, accidental mortality, etc. To combat these problems, along with managing habitats and captive populations, the United States put together a doctrine of policy to limit these effects and control and regulate the mammals within their borders. A marine mammal, as defined by the Marine Mammal Protection Act (MMPA) is any mammal that, "is morphologically adapted to the marine environment (including sea otters and members of the orders Sirenia, Pinnipedia and Cetacea), or primarily inhabits the marine environment (such as the polar bear)..." (Marine Mammal Protection Act of 1972 *as amended*). This declaration of policy was put

forth to help maintain and protect populations of marine mammals as well as their habitats and to continue safe management of marine mammal species that have been and are affected by human actions. Specific clauses acknowledge marine mammals as significant international resources, and insist that actions be taken to help replenish populations of species that are in danger from the consequences of human actions. After being substantially amended in 1994, the new articles included regulations of fishery interactions with marine mammals as well as permits for scientific research (NOAA Fisheries 2012). The MMPA also includes policies on marine mammal health, stranding response, dolphin-safe tuna labeling, and many more (MMPA 2005). These policies are still in effect today, are periodically updated, and are still heavily enforced. However, even though the United States has put forth a great effort to protect marine mammals with the instatement of the Marine Mammal Protection Act, many citizens are uninformed of the terms listed in the legislation.

Beyond the United States, other countries around the world have their own legislation on the management of marine mammals to encompass the protection of all habitats and inhabitants of these ecosystems. In the Pacific Islands, 9 out of 21 Pacific Island territories and countries have proclaimed their waters to be national whale sanctuaries (IFAW 2007). Within Canada, there are multiple national park reserves and national parks that contain their surrounding waters including the Pacific Rim, Forillon, Auyuittuq, and Kouchibouguac (Reeves 2000). There has been some international coordination to protect overlapping international borders, whaling sanctuaries, specific species, and whale stocks through the International Whaling Convention, which oversees the whaling industry worldwide, and the United Nations Convention on the Law of Sea,

which actively conserves marine mammals and follows guidelines of the IWC (Lang 2002). The combined participation of these 48 worldwide countries is vital to the global conservation of healthy whale stocks, which pertains to the removal of marine mammals from wild populations to be integrated into captive programs.

After the 1964 television series *Flipper*, interactions with marine mammals in a captive setting became much more widespread and part of a growing phenomenon. All over the world, oceanariums and aquariums began to create captive programs and displays for many marine mammal species. Millions of tourists travel all over the world annually to see marine mammal exhibits, shows, and personal interactive displays. These programs have presented a great deal of insight for both scientists in research and patrons, giving a lasting impression with hands-on experience. Even though these aquariums and oceanariums have given many people a memorable moment, many others are beginning to question the ethics and justification of keeping these animals confined to a space smaller than they are accustomed to.

Intelligence is a point of controversy in captivity debates. Marine mammal and other animal intelligence cannot be measured precisely, but is based on the ability to perceive, comprehend and understand; however, relative brain size is often used as a means of aptitude. In previous studies, brain size and therefore intelligence, has been associated with various life history traits including sleep quotas, social systems, mating systems, diet, etc. (Worthy et al. 1986). Encephalization quotients (EQ), which are the ratios of actual brain mass to predicted mass, are often used to give a numerical value to intelligence (Austad et al. 1991). Encephalization quotients have been found to vary between orders of marine mammals based on these traits and high EQs of odontocetes, or

toothed whales, including killer whales, dolphins, and porpoises, have been correlated to their use of echolocation (Worthy et al. 1986). Some odontocete species even have higher encephalization quotients than some primates, suggesting intelligence more closely compared to humans (Marino 1998). Many marine mammals species are well known for their echolocation, vocal learning, and imitation, including signature whistles and mating songs (Watkins et al. 2006). This vocal learning as well as learning by imitation and problem solving have played important roles in animal science when defining and measuring animal cognition (Taylor et al. 1973). Many marine mammal species display behaviors indicative of complex cognition and, as the field progresses, scientists can pinpoint their intellect more precisely. As studies outline marine mammal intelligence, the dispute against the maintenance of marine mammals in captivity continues to amplify.

Are marine mammal species better off today because of captivity? Is captivity ethical and should it be continued? As this debate grows stronger, both of these sides of the argument offer substantial evidence in their favor. In this paper, I discuss data for both sides and evaluate the justifications of marine mammal captivity. Ideally, no matter the outcome, this research will educate the public on influential factors of wild and captive populations.

Pros of captivity

Across the United States of America, there are thousands of zoos, aquariums, and oceanariums that house a plethora of species of wild and endangered animals. These animal exhibits and educational programs give millions of guests the opportunity to engage and remember their experiences with these species. Including the benefits these

places offer the public, there are many other advantages to housing a large variety of animals. Allowing people to get a closer look at these animals in a controlled environment promotes scientific research, public awareness, comprehension and understanding. Marine mammals are popular animals to keep on exhibit for their many amiable qualities and easy training capabilities. Furthermore, the following is evidence of scientific research that supports displaying animals through educational value, therapy, research and conservation, respectively.

Hands-on educational experiences have become one of the effective techniques used in all types of learning environments, from elementary schools to colleges, and even interactive learning places such as museums and zoos. Experiential learning plays a significant role in the learning process, giving students hands-on and memorable experiences that can be applied to the real world (Kolb et al. 2009). Zoos and aquariums utilize this approach to maximize their guest experiences, and have created interactions between their animals and guests to leave a lasting impression.

Human-dolphin interactions are popular in many aquariums and oceanariums. Attractions or shows that allow visitors to interact with the animals or see the animals perform have given visitors a temporary increase in conservation-related knowledge, attitudes, and behavioral intentions after their experience (Miller 2009). With the millions of guests per year, this knowledge can become widespread and beneficial towards educating people about marine mammals and their conservation. Participants in these interactive programs have shown a short-term and long-term increase in knowledge, conservation-related behaviors and behavioral intentions (Miller et al. 2012). These improvements of public awareness paired with other beneficial aspects of dolphin

interactions display an example of the advantages these programs can have on conservation education programs.

Another recently popular interactive program is Dolphin Assisted Therapy. This is a type of treatment that has therapeutic potential for people with pathologies or developmental disorders. In a study done with children diagnosed with Autism spectrum disorders, dolphin assisted therapy significantly changed children's behavioral complexity, cognitive performance, cognitive verbal development, and other developmental areas (Salgueiro et al. 2012). Beyond helping children with disabilities, human-dolphin interactions have been shown to reduce stress levels and improve the well-being of participants (Cole 1995). Because of this new innovative category of therapy, its effects have only been modestly studied, and the possible benefits could continue to expand.

Scientific experimentation has benefited from the captivity of marine mammals. When they are in a controlled environment, scientists can easily manage variables that may otherwise compromise their studies. In the wild, it is nearly impossible to manage all variables affecting research. Marine mammals were first put into captivity as early as 1861, and the progress of their husbandry has continued to grow and offer scientists a closer look at these organisms (Mayer 1998). With the addition of extinction, reinforcement, and bridging stimuli to marine mammal training, some of the first behavioral, care, and performance studies were made possible almost 80 years ago by Arthur McBride at Marine Studios, launching the beginnings of marine mammal research (Brando 2010). Scientific findings have improved the knowledge of wild marine mammal populations and have given great insight to the advancement of marine mammal

husbandry. To create baselines and backgrounds for the physiology, hematology, blood characteristics, and infectious disease knowledge of marine mammals, veterinary techniques have been established on captive animals with the routine collection of blood, tissue, and excretory samples (Mayer 1998). Zoos and aquariums alone invest almost \$51 million in scientific research (AZA 2009). Scientific research, paired with the strict regulations of the Marine Mammal Protection Act, provides captive marine mammals with top quality care.

There are over 175 million annual visitors to Association of Zoos and Aquariums (AZA) accredited zoos and aquariums across Canada, Mexico, Argentina, Bahamas, Bermuda, Hong Kong, and the United States. Of these visitors, 94 % feel that these aquariums and zoos are a good instructional outlet to children about animal and habitat conservation efforts. Out of the 175 million annual visitors, over 9 million are students taught through the zoos' and aquariums' educational programs. These AZA institutions have supported conservation efforts every year with almost \$131 million in funding (AZA 2009). These statistics show the large platform that zoos, aquariums, and oceanariums all over the world have to spread their conservation message, as well as educate their guests. A vital component for continuing the ongoing conservation efforts is simply educating the next generations so they too know and understand the significance of marine mammals and their ecosystems.

As the world's population continues to expand, and humans begin to exploit resources all over the world, animals are beginning to suffer the consequences, with habitat loss and other stressors causing endangerment and extinction. To help combat possible extinction, the AZA has developed a Species Survival Plan. The Species

Survival Plan manages the breeding of a species to help maintain captive populations while preserving genetic diversity and demography (Central Florida Zoo 2012). Zoologists and biologists can maintain captive populations of these endangered species and can serve as another learning tool for the parks' guests.

As a debate brews on the ethics of holding marine mammals in captivity, it is important to thoroughly weigh both sides. Do the benefits outweigh the costs? Do the positives justify the negatives? As the scientific and statistical evidence for the pros side accumulates, there is a level argument, one showing high standards of care, boosts in education and conservation efforts, and a growing population of learning, understanding, and acting upon their newly gained knowledge. The negatives must also be analyzed. As with the positives, a case against marine mammals in captivity is presented, so both sides can be evaluated.

Cons of captivity

Even though marine mammal interactive and educational programs offer many benefits to people who attend them, there are arguments about the well-being of the captive animals. Exhibits cannot precisely depict the natural environments that these animals live in, and the misrepresentation can be confusing to guests and limiting and stressful to the animals. The benefits of captivity have been supported by scientific research; however, some evidence offers viable, alternative interpretations and is beginning to negate these positives and provides a basis on which to question whether these captive programs are justifiable.

In a captive environment, marine mammals are confined to a restricted space and are denied some of their natural behaviors. Many marine mammal species are migratory animals and may travel substantial distances throughout their lives. Even nonmigratory species are used to traveling distances to forage for food, attract mates, and raise their young. For millions of years, these mammals have evolved and adapted to the pressures of free-ranging life, just like other animal species. Legislation in many countries, including the Marine Mammal Protection Act, has regulations on the display areas of these animals, but even with governmental regulations, the environments offered are still not adequate enough to compare to an open ocean (Lundin 2010). Accommodating marine mammals, especially larger, wide-ranging species, in environments similar to their indigenous habitats is nearly impossible. The water they are kept in must be chemically treated, and concrete enclosures do not offer a varying environment, contrasting the wild (Rose et al. 2009). World-renowned French naval officer, marine conservationist, scientist and researcher Jacques-Yves Cousteau said:

“No aquarium, no tank in a marine land, however spacious it may be, can begin to duplicate the conditions of the sea. And no dolphin who inhabits one of those aquariums or one of those marine lands can be considered normal.” (Lundin 2010)

For many of these species, this restriction contributes to stress for the animals. Effects of stress on the health of captive marine mammals include stomach ulcers, weight loss, decrease in calving success, decrease in the immune system, lack of appetite, and antisocial behavior (Mason 2010). Many of these animals also face social stress due to the unnatural groupings they are often forced into while on exhibit. Many species of

cetaceans live in small groups, forming strong bonds with each other, and live in highly complex societies (Rose et al. 2009). Some of these species, such as the polar bear, are solitary animals and are put on exhibit with other polar bears, an abnormal and stressed interaction (Rose et al. 2009). Stressors are present in both the wild and in captivity; however, the chronic stress captive environments can place on the animals can lead to physiological problems and even death (Waples et al. 2002). Zoos, aquariums, and oceanariums do offer enrichment such as scents, toys, and training to captive animals to help alleviate boredom and stress levels, however enrichment cannot assuage it entirely. Life in captivity lacks opportunities for variable behavior, and it has been shown that primarily natural features of an environment offer the most effective resources of stimuli to captive animals, so it would be beneficial for exhibits to offer as many natural features as possible to improve animal welfare (Wemelsfelder 1997).

Mortality and birth rates are species specific and vary widely. As stressors of captivity affect marine mammal welfare, mortality and birth rates have become the main concern of animal caretakers and animal support groups. If captivity relieves the stresses of life in the wild, such as competition and environmental factors, then captive animals should be outliving their wild relatives. This is not always the case. Of the marine mammal species in captivity, orcas and other small whales seem to suffer the most. Since 1961, 193 both wild-caught and captive-born orcas have been held in captivity, and as of 2009, 78 % of them are now dead. There have even been 83 known orca pregnancies, with only a 49.2 % survival rate for calves past one year (Rose et al. 2009). Survivorship of bottlenose dolphins remains about the same for wild and captive populations, and after decades of captivity, survivorship lacks significant improvements. Even the lifespan of

wild and captive killer whales is significantly different. As of 2009, less than 20 captive orcas have lived more than 20 years in captivity and only 2 lived more than 35 years in captivity as compared to the average life span of wild killer whales which is an estimated 75 years (Rose et al. 2009). For non-cetaceans, such as seals and sea lions, almost the opposite is true. These animals are living as long as, if not longer than, their wild counterparts and are reproducing at such a high rate, contraceptive measures have to be taken to prevent the animals from overpopulation (Rose et al. 2009). For other species, such as beluga whales or manatees, not enough is known about their life history in the wild or in captivity to make a conclusion on their success on display (Small et al. 1995). Even though some species have shown successful breeding behaviors and increased life span, these results demonstrate the differences and issues in housing cetaceans versus pinnipeds and the complexity of captive care.

Interactive programs at oceanariums, aquariums, and zoos allow guests to interact, often hands-on, with marine mammal species. Swimming and interacting with dolphins are popular tourist attractions, but can be dangerous to both the humans and animals involved. Most marine mammals are carnivorous, apex predators. They hunt and kill their food and even when trained, are highly dangerous. Guests have sustained serious injuries, such as broken arms and sternums when swimming with dolphins. There are also risks involved with disease transmission, especially skin ailments, between dolphins and humans (Rose et al. 2009). Surveys given to participants of dolphin and other marine mammals encounters showed that some participants felt the interaction was too staged and were, in turn, dissatisfied with their experience (Curtin 2007). Trainers, caretakers, and animals have also been injured and even killed by other marine mammals.

Following an incident in 2006 at SeaWorld San Diego with a trainer and an orca, the California state inspector said, “[I]n the simplest terms... swimming with captive orcas is inherently dangerous and if someone hasn’t been killed already it is only a matter of time before it does happen” (Rose et al. 2009). The most recent example of these dangers is the death of trainer Dawn Brancheau during a live show in 2010. The killer whale she was training, Tilikum, was captured off the coast of Iceland when he was around two and has been in captivity ever since. Tilikum has been transported to many oceanariums around the world and is most infamous for previously killing two other people (CBS NEWS 2012). His wild behavior reveals the true nature of these animals and the imminent danger of the people who come in contact with them are in.

Two primary arguments in favor of keeping marine mammals in captivity are the conservation and education aspects of zoos, aquariums, and oceanariums. However, witnessing animals in captive environments may not be the best method for conveying a captivity message. Other atmospheres, such as whale watching tours, dolphin tours, and cetacean-free aquariums, such as Monterey Bay Aquarium, are world-renowned and successful at getting their educational message across without using captive marine mammals (Mooney 1998). After a study done in 1994 on the validity of educational material presented by aquariums and oceanariums housing marine mammals, it was found that some of this information was misrepresented compared to the scientific literature. After interviewing and collecting information from these facilities, scientists discovered that at least six categories of killer whale (*Orcinus orca*) welfare, including longevity, droopy dorsal fins, and habitat, weren’t accurately represented (Hoyt et al. 1994). If these facilities aren’t upholding their obligations to public education and are disregarding their

primary motive for maintaining marine mammals in captivity, their validity cannot be upheld.

Summary

Experimental evidence displays the benefits the scientific community has acquired from the captivity of marine mammals. Scientists all over the world are able to conduct controlled studies and collect data on species that would otherwise be nearly impossible. As their knowledge and studies increase, so does the level of care for these animals. Veterinary science, cognitive and developmental studies, and many other areas of research have significantly progressed with the help of captive animals. Does the science justify the confinement and is it ethical to continue? With advancements in technology like biopsy darts, electronic tags, underwater video, and improved capture-release techniques, research can be more readily done on free ranging animals (Rose et al. 2009). We use captive animals in research as models for their wild relatives, but their relevance is questionable. Captive marine mammals are in chemically treated water, are fed a monitored diet, and are under medical care. Results of experimentation must be justifiable for the confinement of creatures whose intelligence is closely compared to that of humans (Rose et al. 2009). As more is discovered about marine mammals through research, the more the ethics of this research come into question.

According to available research, captive environments induce stress to animals. Additional research indicates that guests of zoological parks, aquariums, and oceanariums leave with a better understanding of marine mammals, their environments, and the importance of their conservation, but sometimes the information is not correct and they

leave with the wrong impression. The captivity of marine mammals is providing a beneficial, hands-on learning experience for guests, but the question is whether the benefits outweigh or justify the costs (Rose et al. 2009).

A relationship that should be evaluated is the correlation between the education of the public and their conservation efforts following their visits. This association is important to address because education and conservation are a primary motivator for captive displays of marine mammals, and their association is an important determinant for the justification of marine mammals in captivity. Ethics of captivity is the main platform for debating captive animal well-being. If there are more efficient, less harmful ways to educate the public, then these measures should be taken to create a harmonious relationship with the wild animals we wish to learn about.

The research substantially supports both sides of the captivity debate, with both positives and negatives for marine mammals in public displays, and this strong evidence for both sides makes a choice difficult. The ethics of decisions are analyzed in every issue from medicine to the economy, and all question the differences between right and wrong. What is the determining factor for keeping marine mammals in captivity? However persuasive both sides of the argument may be, I think there is truth in both, and to accommodate them, there is a compromise that could be met. The public is receiving valuable educational experiences from captive displays, but this may be compromising animals physically, mentally, or both. The best moral and ethical judgments must be formulated to make educated and appropriate decisions for the welfare of these animals.

Conclusion

I believe there is a compromise between confining these animals and educating our communities. Because some captive breeding programs have proven to be successful, we have a moral obligation to maintain these animals that have only known a captive environment. Continually confining and breeding these animals can be detrimental to the genetic variation and wild behavior of captive populations (Kunzl et al. 2002). Captive-born individuals can provide the interactive programs that have demonstrated positive educational experiences, while wild individuals still held in captivity can be gradually eased out of captive populations. Wildlife tours and viewing animals in their natural environment demonstrate an alternative option that proves to be educational while maintaining the welfare of these animals (Miller et al. 2012).

Research is important to the growing fields in science and the education of our people. However, if we continue captivity, it is essential to ensure the most natural and modern care of these animals. Guidelines of the MMPA should be strictly adhered to and frequently updated to coincide with modern veterinary medicine to improve the successful upkeep of these animals. If we continue captive programs, we must do so in a manner that includes the highest care and maximum educational benefits for the public.

Additional research would be worthwhile in order to determine the ethics of maintaining captive animals as well as the success of alternative programs. Further findings could sway an argument, especially those dependent on the quality of life, which could be measured through research. Educational conservation programs are essential tools in instructing upcoming generations on the importance of the planet and its conservation. Therefore, these programs should be continued, but should be modified to accommodate both humans and marine mammals.

References:

- Austad SN, Fischer K. 1991. Mammalian aging, metabolism, and ecology: evidence from the bats and marsupials. *J. Gerontol.* 46(2): B47-B53.
- AZA [Internet] 2009. Visitor Demographics. <http://www.aza.org/visitor-demographics/>
- Brando, SI. 2010. Advances in Husbandry Training in Marine Mammal Care Programs. *Int. J. Comp. Psych.* 23: 791.
- CBS News [Internet] 2012. Dawn Brancheau SeaWorld Trainer Killed. http://www.cbsnews.com/8301-201_162-57479185/caught-on-tape-whale-nearly-drowns-seaworld-trainer/
- Central Florida Zoo [Internet]. 2012. Species Survival Plan. <http://www.centralfloridazoo.sitewrench.com/speciessurvivalplan>
- Cole DM. 1995. Emergent technologies from Human-Dolphin interaction research. *Interactive Technology and New Paradigm for Healthcare*. Chapter 12. Pp. 72-78.
- Curtin S, Wilkes K. 2007. Swimming with captive dolphins: current debates and post-experience dissonance. *Int. J. Tourism Res.* 9: 131-146.
- Hoyt E, Garrett HE, Rose NA. 2009. Observations of disparity between educational material related to Killer whales (*Orcinus orca*) disseminated by public display institutions and the scientific literature. *Orca Network*: 1-15.
- International Fund for Animal Welfare [Internet] 2012. <http://www.ifaw.org/united-states>
- Katona S, Whitehead H. 1988. Are Cetaceans ecologically important? *Oceangr. Mar. Biol.* 26: 553-568.
- Kolb AY, Kolb DA. 2009. Experiential learning theory: A dynamic, holistic approach to management learning, education and development. *The Sage handbook of management learning, education and development*: 42-68.
- Kunzl C, Kaiser S, Meier E, Sachser N. 2003. Is a wild mammals kept and reared in captivity still a wild animal? *Horm. Behav.* 43:187-196.
- Lang A. [Internet] 2002. Overview of International Whaling Convention. Michigan State University College of Law. <http://www.animallaw.info/topics/tabbed%20topic%20page/spuswhales.htm>
- Lundin L. 2010. The welfare of bottlenose dolphins and killer whales in captivity. *Marine Mammal Protection Act of 1972 as amended, and Marine Mammal Protection Act: Subchapter C*. 2005. http://www.nmfs.noaa.gov/pr/pdfs/laws/mmpa_regs_216.pdf
- Marino L. 1998. A comparison of encephalization between odontocete cetaceans and anthropoid primates. *Brain. Behav. Evolut.* 51(4): 230-238.
- Mason G. 2010. Species differences in responses to captivity: stress, welfare and the comparative method. *Trends. Ecol. Evol.* 25(12): 713-721.
- Mayer S. 1998. A Review of the Scientific Justifications for Maintaining Cetaceans in Captivity. A Report for the Whale and Dolphin Conservation Society (WDCS) Whale and Dolphin Conservation Society, UK http://www.wdcs.org/submissions_bin/capmayerscijustifications.pdf
- Miller LJ. 2009. *The effects of dolphin education programs on visitors' conservation-related knowledge, attitude, and behavior.* <http://search.proquest.com/docview/304999555>

- Miller LJ, Zeigler- Hill V, Mellen J, Koeppel J, Greer T, Kuczaj S. 2012. Dolphin Shows and Interaction Programs: Benefits for Conservation Education. *Zoo. Biol.* <http://onlinelibrary.wiley.com/store/10.1002/zoo.21016/asset/zoo21016.pdf?v=1&t=haerdjqd&s=4a5f3ed61811938a8c59304ac307fbd46a2cd824&systemMessage=Wiley+Online+Library+will+be+disrupted+on+15+December+from+10%3A00-12%3A00+GMT+%2805%3A0007%3A00+EST%29+for+essential+maintenance>
- Mooney J. 1998. *Captive Cetaceans: A handbook for campaigners*. Whale & Dolphin Conservation Society (WDCS).
- McDougall PT, Reale D, Dol D, Reader SM. 2006. Wildlife conservation and animal temperament: causes and consequences of evolutionary change for captive, reintroduced, and wild populations. *Anim. Conserv.* 9: 39-48.
- National Oceanic and Atmospheric Association Fisheries Service [Internet] 2012. <http://www.nmfs.noaa.gov/pr/laws/mmpa/>
- Plötz J, Bornemann H, Knust R, Schröder A, Bester M. 2001. Foraging behavior of Weddell seals, and its ecological implications. *Polar. Biol.* 24(12), 901-909.
- Reeves RR. 2000. *The value of sanctuaries, parks, and reserves (protected areas) as tools for conserving marine mammals*. Marine Mammal Commission.
- Rose NA, Parsons ECM, Farinato R. 2009. *Case Against Marine Mammals in Captivity*. The Humane Society of the United States & World Society for the Protection of Animals. http://www.humanesociety.org/assets/pdfs/marine_mammals/case_against_marine_captivity.pdf
- Salgueiro E, Nunes L, Barros A, Maroco J, Salgueiro AI, dos Santos ME. 2012. Effects of a dolphin interaction program on children with autism spectrum disorders-an exploratory research. *BMC Resear. Notes.* 5(1): 199.
- Small RJ, Demaster DP. 1995. Survival of five species of captive marine mammals. *Mar. Mammal. Sci.* 11(2): 209-226.
- Waples KA, Gales NJ. 2002. Evaluating and minimizing social stress in the care of captive bottlenose dolphins (*Tursiops aduncus*). *Zoo. Biol.* 21: 5–26. doi: 10.1002/zoo.10004
- Watkins WA, Wartzok D. 2006. Sensory biophysics of marine mammals. *Mar. Mammal. Sci.* 1(3): 219-260.
- Wemelsfelder F. 1999. Life in captivity: its lack of opportunities for variable behavior. *Appl. Anim. Behav. Sci.* 54: 67-70.
- Worthy GA, Hickie JP. 1986. Relative brain size in marine mammals. *Am. Nat.:* 445-459. <http://www.jstor.org/stable/10.2307/2461329>