

Killer Controversy

Why orcas should no longer be kept in captivity



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Introduction

Since 1964, when a killer whale or orca (*Orcinus orca*) was first put on public display¹, the image of this black-and-white marine icon has been rehabilitated from fearsome killer to cuddly sea panda. Once shot at by fishermen as a dangerous pest, the orca is now the star performer in theme park shows. But both these images are one-dimensional, a disservice to a species that may be second only to human beings when it comes to behavioral, linguistic, and ecological diversity and complexity. Orcas are intelligent and family-oriented. They are long-lived and self-aware. They are socially complex, with cultural traditions. They are the largest animal, and by far the largest predator, held in captivity.

Evidence supports the position that orcas are ill-served by public exhibition. The early benefit of demonstrating to society that they are not mindless killers is uncontested², but is no longer served by continued display. It is not a matter of opinion that orcas do not adjust to captivity; it is a matter of fact. After more than 45 years of exhibiting orcas for human amusement, while at the same time studying them in the wild, we have learned enough about them in both settings to realize that orcas do not belong in captivity.

The Evidence

Longevity/survival rates/mortality

In 1995, Small and DeMaster published a peer-reviewed paper on the survivorship rates of several captive marine mammal species³. This paper showed that, through the end of 1992 (the last year for which a complete set of annual data was available) orcas had significantly lower annual survival rates in captivity than in the wild. Their annual mortality rate (the inverse of survivorship) was more than two and a half times higher in captivity than in the wild. The data source for captive animals was the U.S. Marine Mammal Inventory Report, maintained by the National Marine Fisheries Service, an agency within the U.S. Department of Commerce. The data are provided to the agency by marine mammal public display facilities (henceforth called oceanaria); therefore, the database was if anything biased in favor of display.

The wild whales to which the captive whales were compared were the well-studied northeastern Pacific populations (off the coasts of Washington State and British Columbia), whose life history statistics had first been described in a peer-reviewed paper in 1990⁴ and later confirmed in a 2005 technical publication⁵. While other wild populations might show different life history profiles due to varying habitat quality, it is clear from this population that under objectively good environmental conditions⁶, orcas are capable of life history trajectories similar to human beings. Both sexes reach sexual maturity at approximately 14, females give birth approximately every 5 years and go through menopause at approximately 40-45 years of age,

males live an estimated maximum of 60-70 years, and females live an estimated maximum of 80-90 years. The mean life expectancy for males is approximately 31 years; for females approximately 46 years¹¹.

However, among captive whales, only two females, currently living, have passed the age of 40¹². This is after almost five decades of maintaining the species in captivity and out of approximately 200 individuals ever held for display¹³. Only four females are currently in their early 30s¹⁴, and of females who have died, only one or two were in their 30s at the time of their deaths (as exact ages at capture were not known, the exact ages of wild-caught captive whales cannot be determined). To date no captive males have lived longer than 35 years (the oldest, currently living, is in his early 30s¹⁵), and less than a handful have reached 30¹⁶. The vast majority of captive orcas of either sex die before their early 20s, many still in their early teens¹⁷.

Thus to date the maximum lifespan of captive orcas has matched the mean life expectancy of wild orcas. As a corollary, very few captive orcas who have died achieved the mean life expectancy of wild orcas.

The 1995 Small and DeMaster paper presented the strongest evidence to that time that orcas suffered significant negative impacts from being held in captivity, leading to lower survivorship. The nature of these impacts was not determined or discussed in this paper, but their existence could be inferred from the data. Captivity appeared to be a sub-optimal “habitat” for this species.

These findings, despite being emphasized by advocacy organizations, did not have a significant impact on the general public’s support for orca public display, nor did it start any real debate within the scientific community. The argument was made that captive-born orcas (whose sample size was too small through 1992 for analysis) would show better survivorship than wild-caught animals¹⁸. It was also argued that survivorship would improve as husbandry methods improved¹⁹.

To address these arguments, survivorship was reanalyzed, using the same methodology and primarily the same data

SeaWorld says:

In 2007, SeaWorld⁷, which holds more captive orcas than any other company, responded to a set of questions sent by KGTV of San Diego⁸ and stated the following:

“We have often said that 30 years is as good an estimate of average killer whale lifespan as we currently have. Clearly animals can exceed that age, as evidenced by one of ours, Corky. She is at least 40 and perhaps as old as 42. Peter F. Olesiuk, Graeme M. Ellis and John Ford, three of the world’s most respected marine mammal scientists and individuals who have studied longevity in wild whales for years, recently wrote in the proceedings of the 16th Biennial Conference on the Biology of Marine Mammals that female killer whales in their study group had a mean life expectancy of 31 years and males just 19 years”.

In 2011, Fred Jacobs, the Vice President of Communications at SeaWorld, gave a similar response to a blogger⁹:

“As far as [this scientific research], we are familiar with it... [One of the researchers] himself acknowledges the variability of wild life expectancy in this species: ‘During the period of growth, mean life expectancy of females was 46 years (31 for males)...’ Mean life expectancy of his study group, the Northern Resident Group in British Columbia, declined to 30 years for females and 19 for males.”

In both cases, SeaWorld was referring to studies by Canadian researchers Peter Olesiuk, Graeme Ellis, and John Ford and American researcher Ken Balcomb¹⁰ and was presenting their results out of context. The Pacific Northwest orcas experienced a period of unrestrained growth during the 1970s, 1980s, and early 1990s. During this time, their life history parameters were as presented in this report. The population then experienced a decline in survivorship from 1996 until

source as the Small and DeMaster paper and data compiled through the end of 2010²³. This new analysis determined that captive orca survivorship overall has grown worse in the past decade and a half²⁴. For animals who have entered captivity since 1993 (and thus have experienced only husbandry that has presumably improved since the Small and DeMaster study), survivorship has not changed²⁵. In addition, captive-born animals, although they have survived better than wild-caught animals through 2010, have not survived better than captive orcas overall did through 1992²⁶. Therefore the predicted improvement in survivorship has not in fact materialized, despite the increase in the proportion of captive-born animals making up the sample and despite supposedly continued improvement in husbandry techniques.

The most parsimonious explanation for this failure to show improved survivorship, despite the effort by oceanaria to advance husbandry techniques in the past 45 years, is that orcas are *inherently* unsuited to confinement. No improvements or advances in training, nutrition, veterinary care, husbandry, or transport can “fix” this poor survivorship.

The infant mortality rate in captivity (“infant” defined here as an animal six months of age or younger, including near- to full-term pregnancies where the calf does not survive birth [stillbirths]) is approximately 50%²⁷. Infant mortality rate in the wild is actually unknown, as newborn calves are usually not seen until they are approximately six months of age and calves who die earlier than this will not be observed, but it may be similar²⁸. Given the intense veterinary oversight during pregnancy and birth, it is notable that the captive infant mortality rate is so high.

Kalina was the original “Baby Shamu,” born at SeaWorld²⁹ in September 1985 – the first successful captive birth for orcas anywhere in the world. She was born in the Florida park and died there in October 2010, apparently of an acute infection within hours of exhibiting a poor appetite and “discomfort”³⁰. Her age-at-death sets the current upper limit for captive-born orca longevity – 25 years. Kalina also spent time in SeaWorld’s Texas and California locations and produced four calves (by an age when, had she been a

2001²⁰, which coincided with a series of poor Chinook salmon runs²¹.

These whales’ life history parameters shifted after 1996 and the mean life expectancy of the population fell to 30 years for females and 19 years for males.

SeaWorld ignores the fact that the second set of life expectancies was calculated when the orca population was in decline. It also ignores that the population began to increase again post-2001²².

SeaWorld uses natural variability in survivorship across habitats (leading to variability in life history parameters) to imply that science does not know how long orcas live. However, habitat quality affects survivorship without affecting the intrinsic longevity of a species. Before the modern era, humans had life expectancies far below those of humans today because they did not have adequate protection from predators or the elements, food supplies were of varying quality and reliability, medical knowledge was limited or non-existent and so on. Nevertheless, before technology raised human life expectancies, people were capable of living 100 years or more if circumstances were favorable.

The studies by Olesiuk, Ford, and colleagues showed that on average orcas can expect to live from 30 (male) to 45 years (female) when circumstances are favorable. If they live shorter lives elsewhere, then that is a reflection on habitat quality or other extrinsic factors, not on the species’ intrinsic longevity. SeaWorld attempts to use life history variability to support the claim that its orcas are living natural lifespans, but in fact it unintentionally supports the argument that concrete enclosures are sub-optimal for orcas, the equivalent of marginal, shifting, or degraded habitat.

SeaWorld’s KGTV response also claimed that “The simple fact is this:

typical female in the wild, she might have produced two or three). She was the fourth orca to die at a SeaWorld park within four months. The others were Taima (captive-born, aged 21), who died in Florida in June 2010 while giving birth; Taima's calf, who was stillborn; and Sumar (captive-born, aged 12), who died in California in September 2010 of a twisted intestinal tract³³.

SeaWorld has experienced roughly one orca death per year since its breeding program began – 25 orcas in 26 years, evenly spaced over that time, all but three of whom were younger than 25 years of age when they died and six of whom were 12 or younger³⁴. Given the fact that the animals have access to 24/7 veterinary care and “restaurant-quality” food, this is a poor mortality record, particularly when considering the ages of the animals at death.

When a marine animal dies at an oceanarium, spokespeople will often make statements that death is a natural phenomenon and is to be expected and accepted³⁵. Yet at the same time they claim that captivity provides advantages (e.g., veterinary care, reliable food source, no predators or parasites) not available to the species in the wild³⁶. Therefore, according to oceanarium rhetoric, conditions in captivity are *the same* as in the wild when an animal dies but *better* at all other times. This inconsistent reasoning has unfortunately been accepted for years by the general public, the media, and even the scientific and regulatory communities.

Age distribution

Of more than 130 wild-caught orcas held for public display, only 13 survive in oceanaria around the world³⁷. Nine of these³⁸ are older than the vast majority of captive orcas who have died and, given that they represent less than 10% of the wild-caught animals, should be considered outside the norm in terms of captive longevity³⁹. The remaining 29 living captive orcas are captive-born and therefore younger than 25 (with the death of Kalina, the oldest living captive-born orca is now Orkid, aged 23 years)⁴⁰. Indeed, 17 of the surviving captive-born orcas are younger than 11 years of age⁴¹.

There have been approximately 200 orcas held in captivity, wild-caught and captive-born⁴². Given the number of males and females, natural life expectancies, and the number of years since the first orca entered captivity, a third or more of these animals could reasonably be expected to still be alive today⁴³. Yet only 20% of them are.

In the Pacific Northwest populations, about 46% of the whales are juveniles⁴⁴, whereas in captivity, about 56% are juveniles⁴⁵. In nature, an age distribution skewed toward younger age

No one knows how long...killer whales live because no one has ever followed a group from birth to death”³¹. Fred Jacobs states, “You should recognize that until every member of a group of animals is studied from birth to death, estimates of longevity in this species are just that, estimates”³². However, as any insurance actuary could explain, the calculation of life expectancy does not require following all members of a population from birth to death. Life expectancy is a probability function and only requires a sufficient sampling of life history data to calculate. More than 30 years of data following the individual lives of a population of approximately 300 whales is sufficient. The mathematical modeling these researchers used is well-established and not controversial within the scientific community.

SeaWorld continues to imply that there is significant ongoing debate among scientists about orca life history, when in fact there is not.

classes is often seen in populations that have been in decline, where adult mortality has been abnormally high due to natural disasters, disease, hunting or other threats⁵². Such populations see relative increases in younger age classes during subsequent population growth⁵³.

The captive orca population, however, has remained relatively stable since the 1970s (about 30-50 whales), suggesting that both the birth rate and adult death rate have remained abnormally high since the successful breeding program began in 1985. The former is likely the result of oceanaria breeding their female orcas at younger ages and at shorter intervals than in the wild⁵⁴. Ironically this may be contributing to the latter. Females (of any mammal species) who become pregnant too young or too often can experience physical harm that shortens their lives⁵⁵. In species with long juvenile dependency periods, forcing females to become pregnant too young can also lead to higher levels of infant mortality, as such mothers may not have the essential parenting skills or maturity to successfully rear a calf.

Causes of death

The most common causes of death in captive orcas, wild-caught or captive-born, are pneumonia, septicemia, and other types of infection⁵⁶. That many infections turn lethal in captive orcas highlights the fact that wildlife often does not manifest clinical signs of illness until it is too late for treatment⁵⁷. This raises the logical question of whether veterinary care provides a significant advantage to captive wildlife. Clearly it helps some animals, but others die before treatment can be started or take effect.

A contributing factor to infection-caused mortality in captive orcas may be immunosuppression. Pathogens or injuries that the immune systems of wild orcas would successfully combat or manage may be fatal to captive orcas, due to chronic stress, psychological depression, and even boredom. All of these can cause immune system dysfunction or other health problems in many species, including cetaceans⁵⁸.

SeaWorld says:

SeaWorld characterizes its enclosures, husbandry, training practices, veterinary care, and conservation, research and education programs at its three theme parks as “world class” and “unparalleled”⁴⁶. Many of its educational materials are also readily available on the Internet⁴⁷. However, in several instances the information presented is unclear or confusing.

Longevity

In the most recent *Killer Whales Teacher’s Guide*⁴⁸, SeaWorld states that the typical lifespan of orcas is “probably” 25 to 35 years, and in the current *Killer Whales Animal InfoBook*⁴⁹ SeaWorld claims that: “No one knows for sure how long killer whales live.” This is followed by an observation that scientists have found that orcas in the North Atlantic “*may* live at least 35 years” (emphasis added). A little later, however, the *InfoBook* notes that scientists in the northeastern Pacific “*believe* that if a killer whale survives the first six months [of life], a female’s life expectancy is 50 years and a male’s is 30 years” (emphasis added).

SeaWorld attempts to maintain a degree of ambiguity about the longevity of orcas by providing its audience with conflicting and confusing information and by using terms such as “*may*” or “*believe*” when discussing scientific data. This effort to cast doubt on the best available science regarding orca longevity is counter to the education standards SeaWorld has adopted⁵⁰.

Collapsed dorsal fins

All captive male orcas have collapsed dorsal fins as adults⁵¹, most completely folded over the back. Because of their visibility, these fins tend to draw attention and questions from the public. SeaWorld attempts to

Dental health

The high rate of lethal infection may also be a function of poor dental health. Captive orcas routinely show damaged dentition, primarily broken and worn teeth with the pulp exposed. This is in contrast to wild orcas: many show little or no tooth wear, while those who do tend to specialize in prey with abrasive morphology⁶¹. Broken teeth in wild orcas are rare.

In captivity, the abrasion and breakage comes not from prey, but from gnawing on concrete walls or steel gates that separate the various sections of an enclosure complex⁶² (there are usually at least two enclosures – a primary and a medical – and in larger complexes there can be as many as seven enclosures, all separated by metal gates), often in shows of aggression to animals in neighboring enclosures or due to boredom⁶³. Photographs on the Internet of captive orcas in the open-mouth position, typical of individuals soliciting fish, substantiate this, showing many broken or worn teeth⁶⁴. Tooth breakage invariably leaves the pulp exposed.

In captive orcas, food plugs in the exposed cavity can serve as direct routes for infection to enter the body⁶⁵. According to former trainers, when a tooth breaks, a variable speed drill is used to drill holes directly through the pulp⁶⁶, in a modified pulpotomy⁶⁷. Judging from behavioral reactions, this is uncomfortable for the whale⁶⁸. Once the drilling is complete, the tooth is not sealed or capped and therefore “trainers must irrigate (flush) the bored out [tooth] two-three times each day, for the rest of the orca’s life, to prevent abscess, bacteremia, and sepsis”⁶⁹.

Poor dental health is a known cause of many veterinary/medical conditions, including heart disease and pneumonia⁷⁰. In the case of captive orcas, these open holes “represent a direct route for pathogens to enter the blood stream where they can then be deposited into the tissue of various organs throughout the body, such as the heart or kidney”⁷¹. Yet there is a paucity of oceanarium-published literature on the connection between captive orca dental condition and overall health/mortality⁷², although it seems increasingly likely that poor dental health is involved in – or may even be the direct cause of – many of the lethal infections observed in captive orcas.

characterize the fully collapsed dorsal fins of its male orcas as a normal phenomenon; however, in the wild, only 1-5% of male orcas in some populations (and none in others) have fully collapsed dorsal fins⁵⁹.

In the *Killer Whales Animal InfoBook*, SeaWorld states that no one knows why dorsal fins “bend,” but that some possible causes are “genetics, injuries, or because the fins can be taller than many humans without any hard bones or muscles for support.” If, as this statement suggests, gravity alone might cause a fin to collapse in nature, logic dictates that this would be a common rather than a rare phenomenon in wild whales.

In the *Killer Whales Teacher’s Guide*, SeaWorld describes the use of photographs of dorsal fins to identify individual whales. The text is alongside a picture of an orca with a fully collapsed dorsal fin, and from the picture it is difficult to determine whether the whale is captive or wild. The caption reads: “Some killer whales have irregular-shaped dorsal fins, sometimes leaning to one side.” On the next page, there is an activity that asks students to match up 10 pairs of sketches of orca dorsal fins that were taken five years apart. In both sets, there is a collapsed fin, representing 10% of each sample, a frequency 2-10 times higher than is found in nature.

These SeaWorld statements and graphics leave the impression that collapsed fins are common when in fact erect fins – to heights of 1.8m in adult males – are the norm in nature⁶⁰.

It is telling that oceanaria that display orcas, claiming to be experts on orca health and veterinary care, performing necropsies on all animals who die, have not published more widely in the zoo or veterinary literature on the issues related to captive orca dental health⁷⁵. This failure in veterinary transparency is counter to their public position that they promote education, conservation, and good science⁷⁶.

Aberrant behavior

The only recorded fatal attack by one orca on another occurred in captivity⁷⁷. Incompatibility among captive orcas is frequent, with certain individuals bullied by others, resulting in lacerations and other wounds, and eventually needing separation from dominant individuals⁷⁸. In the wild, aggression has been only rarely observed; where it was, serious injuries did not result⁷⁹.

Although there are records of orca remains found in the stomachs of orcas⁸⁰, these were more likely to have been scavenged than the result of active predation or cannibalism⁸¹. The potential costs to one group of orcas targeting another would likely outweigh the benefits of successful predation⁸². In short, aggressive encounters between orcas in the wild are unlikely to escalate to dangerous levels.

The obvious physical difference between the two “habitats” is that a subordinate animal cannot escape and has no choice regarding his or her companions in captivity. In the wild, a subordinate animal can flee in three dimensions from an aggressor and can actively avoid animals with whom he or she is incompatible⁸³. The obvious social difference is that captive orca groups are wholly artificial, made up of unrelated animals who do not necessarily get along. Paradoxically for such a social animal, it might be better for a captive orca to be solitary, and interact only with long-term, compatible human caretakers, than to be in a group of other whales who are hostile or behave aggressively.

Injurious aggression is not the only aberrant behavior observed in captive orcas. Captive females have been known to reject or act aggressively toward their newborns⁸⁴ or

SeaWorld says:

The Occupational Safety and Health Administration issued a citation to SeaWorld on 23 August 2010 in the death of trainer Dawn Brancheau for a “willful” violation of safety regulations (“willful” is defined as an act committed with plain indifference to or intentional disregard for employee safety and health)⁷³. In a subsequent statement, SeaWorld said that its trainers are “among the most skilled, trained and committed zoological professionals in the world today. The fact that there have been so few incidents over more than 2 million separate interactions with killer whales is evidence not just of SeaWorld’s commitment to safety, but to the success of that training and the skill and professionalism of our staff”⁷⁴.

However, the proportion of *interactions* that result in incidents is not the proper statistic to use. An analogy would be if a particular factory machine can be used thousands of times before a part fails and seriously injures or kills a factory worker. If a significant number of these machines are in use and some proportion of them have this deficiency, the question then becomes how many of them will eventually fail, not how many times these affected machines can be used before they fail. If only a very small proportion of the machines have this deficiency (say, less than 2% out of the total number of machines in use), this might be a tolerable risk for the industry in question. How great a risk is tolerable to society depends on how important the product produced is and how great the cost would be of replacing or redesigning the machine. However, the risk begins to look prohibitive if the proportion of deficient machines is sufficiently high. If the failure rate reaches a level where the public, the government, and even the manufacturer conclude that it is too high, then the machines would be recalled.

As noted earlier, there have been

simply fail to effectively care for or nurse them⁸⁶. While this type of mother-calf dysfunction may also occur in the wild, only a small number of “orphaned” calves have been observed there⁸⁷ and maternal inattention or aggression is rarely observed⁸⁸.

The aberrant behavior seen in captive orcas is suggestive of abnormal social and psychological development of animals raised in or born into artificial social groups and “habitats.” This conclusion is further supported by the history of aggressive interactions between orcas and people in captivity.

Human injuries and deaths

Throughout recorded history, there have been no reliable reports of wild orcas killing a human being⁸⁹. In contrast, four people have been killed by captive orcas. Three orcas drowned a part-time trainer in 1991⁹⁰. One of these three was involved in the death of a member of the public eight years later⁹¹ and this same whale killed his long-time trainer 11 years later⁹². A fourth whale killed his trainer only nine weeks earlier⁹³.

There have been very few reports of serious injuries inflicted by wild orcas on humans; one surfer required stitches in his leg in 1972⁹⁴. The few other reported incidents were minor and resulted in little or no injury⁹⁵. In contrast, there have been dozens of significant incidents between people and captive orcas, including serious injuries requiring hospitalization, throughout the 47 years this species has been on public display⁹⁶.

The contrast is clear – in the wild, despite centuries of encounters between seafarers (including modern researchers) and orcas, there have been no human deaths and very few serious injuries recorded. Yet in only 47 years of placing orcas in artificial proximity to people, there have been dozens of serious injuries involving dozens of different animals and four deaths involving four different animals. Captivity not only leads to early death for the animals – it puts people at significant risk of injury and death as well.

Conclusion

We maintain that the only logical conclusion, after considering the preceding evidence, is that orcas do not belong in captivity. They do not thrive: they are physically harmed, living shorter lives, and they are psychologically harmed, injuring each other and humans in a way rarely or never observed in the wild.

approximately 200 orcas held in captivity since 1964. Forty-two of them are currently living. Of these 200 animals, at least two dozen (more than 10%) are known to have been involved in serious incidents that threatened the lives or safety of people interacting with them (trainers and others)⁸⁵. It is possible this number is even larger (oceanaria do not publicize incidents that occur outside of public view). Four whales – 2% – have killed their trainers. Therefore the “failure rate” for captive orcas is in the double digits and the fatality rate is 2%. Together these rates might lead to a recall if these animals were machines.

Given that the product here is entertainment-based performances, this level of risk – to the orcas and their trainers – is not justified. Educational opportunities provided by various media and advanced technology can replace live orca exhibits.

Considering orca natural history, it is unsurprising that orcas do not thrive in captivity. They are kin-bonded creatures, with a long dependency period on the mother and life-long family ties to her, their siblings and more distant relations¹⁰⁰. When in captivity, they are kept in artificial social groups with no resemblance to those in nature. They are cooperative predators, whose home ranges are hundreds if not thousands of square kilometers in size¹⁰¹ and who can and often do swim almost 200 kilometers in a day. When in captivity, they are made to exist inside a comparatively small concrete enclosure, less than one ten-thousandth of normal habitat size¹⁰². Captivity cannot adequately provide for such large, social, wide-ranging predators¹⁰³.

A captive orca bears little resemblance to a wild one and the evidence is mounting that these animals, raised within or born into profoundly abnormal circumstances, are themselves abnormal. However, for 47 years oceanaria holding orcas have been telling the public that captive orcas thrive and indeed that they might even be better off in human care than facing the challenges of a wild existence¹⁰⁴. The facts show otherwise.

Ending the public display of orcas

There are currently 42 orcas in captivity world-wide, held in 12 facilities in seven countries. Captive breeding occurs in only some of these facilities, most notably the SeaWorld parks in the United States, Kamogawa Sea World in Japan, and Marineland Antibes in France. The vast majority of births occur at SeaWorld parks. These circumstances support the contention that ending the public display of orcas is manageable and would have only minor economic impacts, primarily affecting only a small number of public display facilities.

Captive breeding of this species should end, as it serves no conservation purpose¹⁰⁵. Live trade in orcas should also end¹⁰⁶. The population of captive orcas can be eliminated through attrition, with the animals currently alive evaluated for continued display, retirement to sea pens, or rehabilitation and possible release to the wild if appropriate.

SeaWorld says:

On 24 February 2010, Tilikum, an approximately 30-year-old male orca held at SeaWorld Florida, brutally killed his long-time trainer, Dawn Brancheau. On 3 March 2010, The Humane Society of the United States (HSUS) sent a letter to the Blackstone Group, the corporate parent of SeaWorld, requesting a meeting and offering to discuss a proposal for his future. The proposal was not to release Tilikum into the wild, but to retire him to a sea pen. The HSUS noted that he could be on public view⁹⁷, for a fee, so the company would not suffer an economic loss.

SeaWorld refused this proposal and housed Tilikum primarily in the back tank of the Florida complex for the next 13 months, not using him in the show. Trainers did not approach close enough to touch him during this time. As of 30 March 2011, he is once again used in the show, but he is still not touched by his trainers⁹⁸.

In its proposal to Blackstone, The HSUS noted its experience with the Keiko Project⁹⁹, which the organization had managed during the final 20 months of Keiko's life. In a reply dated 16 March 2010, SeaWorld's president, Jim Atchison, stated the following:

"I am familiar with your role in the tragic release experiment involving Keiko...It illustrates the cruelty of attempting to return a long-captive marine mammal to the wild..."

"HSUS proceeded with an experiment that...cost an innocent animal his life..."

"The release of Keiko was a disgraceful act. It was executed in a way that was, by any standard, irresponsible and reckless. To cite the Keiko experiment as anything other than a waste of valuable resources and a failure with tragic consequences for this animal is to rewrite history."

The 12 affected oceanaria would thus have a number of years (possibly 30 or more in some cases)¹¹⁰ to transition their exhibits from orca performances to another medium. To protect trainers during the transition period, all in-water work with these animals should end.

We emphasize that we are not proposing blanket closure of oceanaria. We are proposing a phasing out of orca exhibition, taking as long as three decades, giving oceanaria sufficient time to repurpose their orca enclosures. We believe this is eminently reasonable and will minimize the financial impacts of ending this practice.



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What next?

As a society, we are paying more attention to the well-being and psychology of captive animals, and it is logical that we should look at the record for captive orcas. The purpose of this report is to set out the evidence that orcas do not belong in captivity. It is not justified to continue their display for entertainment or even for education, especially when that education is biased toward information that supports a corporate narrative¹¹¹ rather than good science.

As long as the public buys tickets to see orcas perform, oceanaria are unlikely to voluntarily close orca exhibits. Therefore it is up to the public, as well as the media, the regulatory agencies, and the scientific community, to consider and weigh the evidence and make the only logical deduction. Orcas are too large, too intelligent, and too behaviorally and socially complex to adequately provide for

“You write in triumphant terms about an animal that was never accepted by wild whales, suffered serious injuries, and died prematurely and unnecessarily. Keiko should have lived out his life in the company of other members of his species in an accredited and professionally operated zoological institution. That would have been the humane thing to do.”

SeaWorld’s claim that Keiko died “prematurely” at the age of 26 years is inconsistent with the company’s own history. Twenty-four of the past 25 SeaWorld orca deaths were of animals younger than this, most by many years. The four orcas who died most recently, in 2010, were all younger than Keiko was when he died.

In fact, Keiko lived for five years in Scandinavian waters. Tracked by satellite, he swam between Iceland and Norway in summer 2002, crossing the north Atlantic over the course of three weeks. He arrived in Norway in good health¹⁰⁷. He interacted over the course of three summers with wild whales, although it is true he was never fully accepted by them. He was never seriously injured, although he suffered scrapes on his head when he encountered ice during his second-to-last winter in Norway. These scrapes were fully healed within weeks¹⁰⁸.

SeaWorld’s strong condemnation of the Keiko Project as a failed experiment is disingenuous, given that the company’s initial efforts in the 1960s to maintain orcas in captivity could also be viewed as experimental¹⁰⁹. SeaWorld rewrites history whenever it refuses to acknowledge the failures in those early days, which cost many animals their lives.

Finally, it should be noted that SeaWorld was always in a position to do the self-described “humane thing” for Keiko. It could have acquired him at any time during his tenure in Mexico City, where he was on display for 11 years, especially once he was

in concrete enclosures. No more orcas should have to die prematurely; no more trainers should be put at risk. It is time to accept that we have been wrong in our assumptions. The orcas deserve no less.

big enough for his owners to begin considering options for his future as he outgrew his tank. Alternatively, it could have offered assistance in improving Keiko's situation in the small, over-warm tank in which he was held, where his only companions were bottlenose dolphins. Neither happened; SeaWorld left him there.

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John Kielty of The Orca Project (<http://www.theorcaproject.com>) reviewed the Marine Mammal Inventory database for relevant data on captive orcas for the annual survivorship rate (ASR) analysis. He created a comprehensive Excel spreadsheet and researched other sources to identify missing data from the database (see <http://theorcaproject.files.wordpress.com/2011/03/mmir-deficiency-evaluation-killer-whales2.pdf>). From this database, Katheryn Patterson, a graduate student at George Mason University, computed the 2011 ASRs. HSI/HSUS is extremely grateful to them both for their work.

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All URLs were accessed on 9 September 2011.

¹ MacDonald, D. 1965. The saga of Moby Doll. *Reader's Digest* 86: 34; Bigg, M. A. and Wolman, A.A. 1975. Live capture killer whale (*Orcinus orca*) fishery, British Columbia and Washington, 1962-73. *Journal of the Fisheries Research Board of Canada* 32: 1213-1221.

² See, for example, Ford, J.K.B., Ellis, G.M., and Balcomb, K.C. 1994. *Killer Whales: The Natural History and Genealogy of Orcinus orca in British Columbia and Washington State*. UBC Press, Vancouver, 102 pp.

³ Small, R.J. and DeMaster, D.P. 1995. Survival of five species of captive marine mammals. *Marine Mammal Science* 11: 209-226.

⁴ Olesiuk, P.F., Bigg, M.A., and Ellis, G.M. 1990. Life history and population dynamics of resident killer whales (*Orcinus orca*) in the coastal waters of British Columbia and Washington State. *Report of the International Whaling Commission*. Special Issue 12: 29-243.

⁵ Olesiuk, P.F., Ellis, G.M., and Ford, J.K.B. 2005. Life history and population dynamics of northern resident killer whales (*Orcinus orca*) in British Columbia. Canadian Science Advisory Secretariat Research Document 2005/045, 75 pp., available at http://www.dfo-mpo.gc.ca/csas-sccs/publications/resdocs-docrech/2005/2005_045-eng.htm.

⁶ The "Pacific Northwest" marine ecosystem of the U.S. and Canada is rich in biological resources (e.g., Hoyt, E. 1984. *Orca: The Whale Called Killer*. Camden House, Ontario, 287 pp.), although increasing human-caused habitat degradation is a growing threat to its productivity (e.g., Petition to list the southern resident killer whale (*Orcinus orca*) as an endangered species under the US Endangered Species Act, May 1, 2001, available at http://www.biologicaldiversity.org/species/mammals/Puget_Sound_killer_whale/pdfs/petition.pdf).

⁷ Prior to 2009, SeaWorld's corporate name was SeaWorld, Inc. In 2009, the company was sold and became known as SeaWorld Parks & Entertainment, Inc. In this report, it is referred to as SeaWorld and the individual parks are referred to as SeaWorld California, Texas, and Florida. See also endnote #29.

⁸ <http://www.10news.com/download/2007/0518/13349802.pdf>.

⁹ <http://theorcaproject.wordpress.com/2010/09/09/what-its-like-to-be-banned-from-seaworlds-facebook-page/>.

¹⁰ Ford, J.K.B., Ellis, G.M., Olesiuk, P.F., and Balcomb, K. 2005. Linking prey and population dynamics: Did food limitation cause recent declines of 'resident' killer whales? Abstract submitted to the 16th Biennial Conference on the Biology of Marine Mammals, San Diego, California, 12-16 December 2005, p. 94; Olesiuk *et al.* 2005 *op. cit.*

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- ¹¹ Olesiuk *et al.* 1990 *op. cit.*; Olesiuk *et al.* 2005 *op. cit.*
- ¹² Corky, at SeaWorld California and Lolita, at the Miami Seaquarium; both are approximately 45.
- ¹³ Dozens of contemporaries from captures in the 1960s and early 1970s could potentially still be alive and of similar age as these two females, but most died within a few years of capture – see <http://www.orcahome.de/deaddied.htm>.
- ¹⁴ Katina, Kasatka, Kiska, and Freya – the first three are at SeaWorld parks, the last at Marineland Antibes in France.
- ¹⁵ Ulises, at SeaWorld California.
- ¹⁶ <http://www.orcahome.de/orcastat.htm>; Marine Mammal Inventory Report, maintained by the U.S. National Marine Fisheries Service. Tilikum, a male at SeaWorld Florida, is currently about 30 years of age.
- ¹⁷ *Ibid.*
- ¹⁸ Small and DeMaster *op. cit.*
- ¹⁹ See, for example, McBain, J.F. 1999. Cetaceans in captivity: A discussion of welfare. *Journal of the American Veterinary Medical Association* 214: 1170-1174; Small and DeMaster *op. cit.*
- ²⁰ Olesiuk *et al.* 2005 *op. cit.*
- ²¹ Ford *et al.* 2005 *op. cit.*
- ²² *Ibid.*
- ²³ This report; Jett, J.S. and Ventre, J.M. 2011. Keto and Tilikum Express the Stress of Orca Captivity. Report submitted to The Orca Project, St. Pete Beach, Florida, 21 pp., available at <http://theorcaproject.wordpress.com/2011/01/20/keto-tilikum-express-stress-of-orca-captivity/>.
- ²⁴ In 1995, the calculated annual survival rate (ASR) for captive orcas overall (wild-caught and captive-born, males and females, calves and non-calves) was 0.937. Looking only at non-calves (defined in the 1995 analysis as animals who survived beyond the first year of life), the ASR was 0.938, which was statistically lower than the non-calf ASR of 0.976 for wild orcas. (A 0.938 ASR equates to a 6.2% annual mortality rate, which was roughly 2.5 times higher than the annual mortality rate of non-calves in the Pacific Northwest populations.) In 2011, the ASR for captive orcas overall was 0.916 – this equates to an 8.4% annual mortality rate. Looking only at non-calves, the 2011 ASR was slightly higher – 0.927 vs. 0.916 – but still lower than in 1995. These values do not include stillbirths, miscarriages, deaths of fetuses in the womb when the mother dies, escaped animals, released animals, or animals with unknown acquisition or death dates.
- ²⁵ The 2011 ASR for all orcas who have entered captivity since 1 January 1993 (this includes by birth, rescue, stranding, and capture) was 0.935.
- ²⁶ The 2011 ASR for all captive-born orcas (this category did not have a large enough sample size for analysis in 1995) was 0.937. This is the same value as overall survivorship through 1992, although it is higher than the overall ASR through 2010 (0.916). Wild-caught orcas have shown the lowest survivorship in captivity through 2010, with an ASR of 0.909 – an annual mortality rate of 9.1%.
- ²⁷ The 2011 ASR for captive-born calves (defined as six months of age or younger, including stillbirths) is 0.498, or a 50.2% mortality rate. This value excludes known miscarriages. Because some stillbirths may go unreported, this figure is probably an underestimate. See also Rose, N.A., Parsons, E.C.M., and Farinato, R. 2009. *The Case Against Marine Mammals in Captivity*. The Humane Society of the United States and the World Society for the Protection of Animals, Washington, D.C., 76 pp., available at http://www.humanesociety.org/assets/pdfs/marine_mammals/case_against_marine_captivity.pdf.
- ²⁸ Olesiuk *et al.* 2005 *op. cit.*
- ²⁹ SeaWorld holds more than half of all the world's captive orcas (it currently owns 24 orcas, including five held by other parks) and was one of the first oceanaria to display this species, beginning in 1965 (see <http://www.seaworld.org/education-programs/swc/history/history.htm>). Its iconic orca is “Shamu,” a stage name used by several whales during performances. See also endnote #7.
- ³⁰ Jett and Ventre *op. cit.*; <http://www.wesh.com/r/25282267/detail.html>.
- ³¹ <http://www.10news.com/download/2007/0518/13349802.pdf>.
- ³² <http://theorcaproject.wordpress.com/2010/09/09/what-its-like-to-be-banned-from-seaworlds-facebook-page/>.
- ³³ http://articles.orlandosentinel.com/2010-06-06/travel/os-sea-world-killer-whale-dies-20100606_1_killer-whale-killer-whale-jolts-trainer (Taima and calf); <http://www.10news.com/news/25600548/detail.html> (Sumar).

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- ³⁴ <http://www.orcahome.de/orcastat.htm>; N. Rose, unpublished data.
- ³⁵ See, for example, <http://www.practicalfishkeeping.co.uk/content.php?sid=3745>, quote by Allan Zeman, chairman of Ocean Park, Hong Kong: “[Death is] quite normal...people die and babies are born every day”; see also Hutchins, M. 2006. Death at the zoo: The media, science, and reality. *Zoo Biology* 25: 101-115.
- ³⁶ See, for example, <http://www.ammpa.org/faqs.html#1>; Andrews, B. 1995. The Sea World view: Why Corky can’t go home. *BBC Wildlife* 13: 34.
- ³⁷ <http://www.orcahome.de/orcastat.htm>; one of these is Morgan, a young whale rescued in June 2010 after being found alone and emaciated in the Wadden Sea and as of September 2011 being held temporarily at the Harderwijk Dolfinarium in the Netherlands.
- ³⁸ These nine are, in descending order of age, Corky (F), Lolita (F), Katina (F), Kasatka (F), Kiska (F), Ulises (M), Freya (F), Tilikum (M), and Bingo (M). As of the date of publication of this report, the oldest, Corky and Lolita, are approximately 45 years of age; Bingo, the youngest, is approximately 29 years old.
- ³⁹ For a description of statistical distributions of data such as age, see Morgan, G.A., Leech, N.L., Gloeckner, G.W., and Barrett, K.C. 2004. *SPSS for Introductory Statistics: Use and Interpretation, 2nd Edition*. Lawrence Erlbaum Associates, Inc., Mahwah, N.J., 224 pp.
- ⁴⁰ <http://www.orcahome.de/orcastat.htm>.
- ⁴¹ *Ibid.*
- ⁴² *Ibid.*
- ⁴³ The sex ratio of the captive population has been roughly 50:50, although there have been slightly more females than males in the group (<http://www.orcahome.de/orcastat.htm>). Had the earliest captives been juveniles when taken (this is the general rule when targeting individuals during a capture, as younger animals adapt better than older ones) and had they survived, none would be older than 50 or 55 years of age. As 46 is the mean life expectancy for female orcas in the wild – which is roughly 20 years short of the maximum estimated lifespan for male orcas – it is conservative to estimate that about a third or more of these 200 whales would still be alive today if survivorship in captivity was the same as in the wild and certainly if it was *better* than in the wild. That is, at least half of the females – the mean is not the median, but it is a good approximation – and some additional number of males would still be alive. This is a very conservative estimate, as in fact more than half of the females should still be living, as they would be far younger than 46.
- ⁴⁴ Olesiuk *et al.* 2005 *op. cit.*
- ⁴⁵ <http://www.orcahome.de/orcastat.htm>.
- ⁴⁶ Scardina, J. 2010. SeaWorld Parks and Entertainment testimony on marine mammals in captivity: What constitutes meaningful education, for an oversight hearing before the House Natural Resources Committee Sub-Committee on Insular Affairs, Oceans, and Wildlife, 27 April, available at <http://naturalresources.house.gov/UploadedFiles/ScardinaTestimony04.27.10.pdf>.
- ⁴⁷ <http://www.seaworld.org/>.
- ⁴⁸ <http://seaworld.org/just-for-teachers/guides/pdf/whales-4-8.pdf>.
- ⁴⁹ <http://www.seaworld.org/animal-info/info-books/killer-whale/index.htm>.
- ⁵⁰ AMMPA educational standards, 1994 (FR 59, <http://www.gpo.gov/fdsys/pkg/FR-1994-10-06/html/94-24787.htm>).
- ⁵¹ N. Rose, personal observation; National Marine Fisheries Service. 2005. Proposed Conservation Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Seattle, Washington, 183 pp.
- ⁵² Ricklefs, R. 2008. *The Economy of Nature, 6th Edition*. W.H. Freeman & Company, New York City, 700 pp.
- ⁵³ *Ibid.*
- ⁵⁴ In the wild, as noted earlier, first birth occurs at approximately 14 years of age in females. This age may be biased upward, given the potentially high number of first-born calves who die before researchers can observe them (Duffield, D.A., Odell, D.K., McBain, J.F., and Andrews, B. 1995. Killer whale (*Orcinus orca*) reproduction at Sea World. *Zoo Biology* 14: 417-430). Nevertheless, it remains likely that first conception/birth occurs several years later in wild orcas than in captive ones, as captive-born females have given birth for the first time at the age of 8 (e.g., Kalina, Taima, Kohana), meaning conception took place as young as 6. The interbirth interval in the wild is approximately five years; in captivity it is as short as two or three.

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- ⁵⁵ See, for example, Kirkpatrick, J.F. and Turner, A. 2007. Immunocontraception and increased longevity in equids. *Zoo Biology* 26: 237-244.
- ⁵⁶ Marine Mammal Inventory Report; Greenwood, A.G. and Taylor, D.C. 1985. Captive killer whales in Europe. *Aquatic Mammals* 1: 10-12.
- ⁵⁷ McBain, J.F. 2001. Cetacean medicine. In: *CRC Handbook of Marine Mammal Medicine, 2nd edition* (L.A. Dierauf and F.M.D. Gulland, eds). CRC Press, New York, pp. 895-907; Hutchins *op. cit.*
- ⁵⁸ Romero, L.M. and Butler, L.K. 2007. Endocrinology of stress. *International Journal of Comparative Psychology* 20: 89-95; Waples, K.A. and Gales, N.J. 2002. Evaluating and minimising social stress in the care of captive bottlenose dolphins (*Tursiops aduncus*). *Zoo Biology* 21: 5-26; Maes, M. 2000. Evidence for an immune response in major depression: A review and hypothesis. *Progress in Neuro-Psychopharmacology and Biological Psychiatry* 19: 11-38; O'Hanlon, J. F. 1981. Boredom: Practical consequences and a theory. *Acta Psychologica* 49: 53-82; Sommers, J. and Vodanovich, S. J. 2000. Boredom proneness: Its relationship to psychological and physical health symptoms. *Journal of Clinical Psychology* 56: 149-155; Jett and Ventre *op. cit.*
- ⁵⁹ See, for example, Ford *et al.* 1994 *op. cit.*
- ⁶⁰ Ford, J.K.B. 2009. Killer whales. In: *Encyclopedia of Marine Mammals* (W.F. Perrin, B. Wursig, and J.G.M. Thewissen, eds.). Academic Press, New York, pp. 669-676; National Marine Fisheries Service *op. cit.*
- ⁶¹ Ford, J.K.B., Ellis, G.M., Matkin, C.O., Wetklo, M.H., Barrett-Lennard, L.G., and Withler, R.E. 2011. Shark predation and tooth wear in a population of northeastern Pacific killer whales. *Aquatic Biology* 11: 213-224; see also Guerrero-Ruiz, M., Pérez-Cortés M., H., Salinas Z., M., and Urbán R., J. 2000. First mass stranding of killer whales (*Orcinus orca*) in the Gulf of Mexico, California. *Aquatic Mammals* 32: 265-272.
- ⁶² Jett and Ventre *op. cit.*; Graham, M.S. and Dow, P.R. 1990. Dental care for a captive killer whale (*Orcinus orca*). *Zoo Biology* 9: 325-330.
- ⁶³ Jett and Ventre *op. cit.*
- ⁶⁴ <http://www.orcahome.de/orcastat.htm> - click on each animal's name to see individual photo galleries.
- ⁶⁵ Jett and Ventre *op. cit.*; Graham and Dow *op. cit.*
- ⁶⁶ Jett and Ventre *op. cit.*; Graham and Dow *op. cit.* argued that invasive care (such as drilling) was not necessary for worn teeth, but the animal evaluated in their paper had worn rather than broken teeth. The latter's adequate care may require different methods.
- ⁶⁷ Pulpotomy: Surgical removal of a portion of the dental pulp, usually of the coronal portion. In: *The American Heritage Medical Dictionary*, 2007. Houghton Mifflin Company, Boston.
- ⁶⁸ Jett and Ventre *op. cit.*
- ⁶⁹ *Ibid.*, p. 2.
- ⁷⁰ Li, X., Kolltveit, K.M., Tronstad, L., and Olsen, I. 2000. Systemic diseases caused by oral infection. *Clinical Microbiology Reviews* 13: 547-558.
- ⁷¹ Jett and Ventre *op. cit.*, p. 3.
- ⁷² Loch, C., Grando, L.J., Kieser, J.A., and Simões-Lopes, P.C. 2011. Dental pathology in dolphins (Cetacea: Delphinidae) from the southern coast of Brazil. *Diseases of Aquatic Organisms* 94: 225-234; Glatt, S.E., Francl, K.E., and Scheels, J.L. 2008. A survey of current dental problems and treatments of zoo animals. *International Zoo Yearbook* 42: 206-213.
- ⁷³ http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=18207.
- ⁷⁴ See http://articles.cnn.com/2010-08-23/us/seaworld.fine_1_dawn-brancheau-seaworld-trainers-killer-whale/2?s=PM:US – the original statement from SeaWorld has been removed from its website, as its archive only holds material from the previous six months.
- ⁷⁵ Glatt *et al. op. cit.*
- ⁷⁶ AMMPA educational standards *op. cit.*; <http://www.ammpa.org/>.
- ⁷⁷ <http://www.nytimes.com/1989/08/23/us/performing-whale-dies-in-collision-with-another.html>.
- ⁷⁸ Jett and Ventre *op. cit.*; Williams, V. 2001. *Captive Orcas: Dying to Entertain You*. Report submitted to WDCS, Whale and Dolphin Conservation Society, Chippenham, U.K., 100 pp., available at http://www.wdcs.org/submissions_bin/orcareport.pdf.
- ⁷⁹ N. Rose, personal observation.

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- ⁸⁰ Shevchenko, V.I. 1975. Nature of correlations between killer whales and other cetaceans. *Morskiye Mlekopitayuschchiye* 1975: 173-175.
- ⁸¹ Visser, I.N. 1998. Prolific body scars and collapsing dorsal fins on killer whales (*Orcinus orca*) in New Zealand waters. *Aquatic Mammals* 24: 71-82.
- ⁸² Two groups of orcas would essentially be evenly matched. The attacker(s) could be seriously injured if the target animal(s) mounted a defense or could expend considerably more energy than would be recouped if the target animal(s) chose to flee.
- ⁸³ Waples and Gales *op. cit.*
- ⁸⁴ Halyn, born in 2005, was raised by hand at SeaWorld Texas after her mother Kayla failed to nurse her and died aged 2.5 years, see http://en.wikipedia.org/wiki/List_of_captive_orcas#Kayla; Adán, born at Loro Parque in October 2010 and alive as of August 2011, was rejected by his mother Kohana and is being raised by hand, see http://www.tenerifeneews.com/index.php?option=com_content&view=article&id=15243:a-killer-whale-born-in-loro-parque-puerto-de-la-cruz-tenerife&catid=41:rotator-news; Sumar was separated from his mother Taima when less than four months of age, after she “attacked” him, see <http://www.10news.com/news/24913472/detail.html>.
- ⁸⁵ <http://www.orcahome.de/incidents.htm>.
- ⁸⁶ The best example of this was Corky, who became pregnant seven times. One of the calves was stillborn and two were miscarried, while of those born alive, none lived longer than 48 days. She seemed unable or unwilling to care for them properly, see http://en.wikipedia.org/wiki/List_of_captive_orcas#Corky.
- ⁸⁷ These three were Springer (A73) and Luna (L98) of the northeastern Pacific populations and Morgan (see endnote #37).
- ⁸⁸ N. Rose, personal observation.
- ⁸⁹ Hoyt *op cit.*
- ⁹⁰ <http://www.pbs.org/wgbh/pages/frontline/shows/whales/debate/trainers.html>.
- ⁹¹ <http://www.nytimes.com/1999/09/21/science/park-is-sued-over-death-of-man-in-whale-tank.html>.
- ⁹² <http://www.huffingtonpost.com/2010/02/24/seaworld-trainer-dead-killed-475408.html>.
- ⁹³ <http://www.loroparque.com/en/detalleNoticia.asp?id=2441>.
- ⁹⁴ <http://news.google.com/newspapers?nid=2245&dat=19960117&id=Glo1AAAAIBAJ&sjid=QiEGAAAAIBAJ&pg=3872,1646286>.
- ⁹⁵ http://seattletimes.nwsourc.com/html/localnews/2002444869_webwhale18.html.
- ⁹⁶ See, for example, incidents described in di Matteo, E. 1996. Mayhem in Marineland. *NOW Magazine* 16: 18-19/27; Reed, D.C. 1981. *Notes from an Underwater Zoo*. Dial Press, New York, p. 250; Riciuti, E.R. 1973. *Killer of the Sea*. Walker and Company, New York, pp. 232-233; see also <http://www.nytimes.com/1988/04/04/us/at-sea-world-stress-tests-whale-and-man.html> and <http://www.signonsandiego.com/news/2006/nov/30/killer-whale-bites-trainer-takes-him-tank-bottom/>. There have been dozens of other incidents.
- ⁹⁷ Indeed, there is no other legal option, as the Marine Mammal Protection Act does not allow for long-term captive holding of marine mammals in the U.S. except for the purpose of public display or scientific research.
- ⁹⁸ See, for example, <http://www.dailymail.co.uk/news/article-1371403/Tilikum-SeaWorld-puts-dangerous-whale-killed-trainer-show.html>.
- ⁹⁹ Keiko was the orca who starred in the 1993 Warner Brothers movie “Free Willy.”
- ¹⁰⁰ Ford *op. cit.*
- ¹⁰¹ *Ibid.*
- ¹⁰² Rose *et al. op. cit.*
- ¹⁰³ See also Clubb, R. and Mason, G. 2003. Captivity effects on wide-ranging carnivores. *Nature* 425: 473-474.
- ¹⁰⁴ See, for example, McBain 1999 *op. cit.*
- ¹⁰⁵ Oceanaria claim that their captive breeding programs are conservation programs, but orcas as a species are not endangered or threatened; where they face threats the problem is not lack of reproductive success but habitat degradation affecting survival; and no captive-born animals are destined for release to the wild. These elements do not meet any common definition of conservation breeding (e.g., Mallinson, J.C. 1995. Conservation breeding programmes: An important ingredient for species survival. *Biodiversity and Conservation* 4: 617-635; International

Union for the Conservation of Nature (IUCN) Policy Statement: "Reintroduction to the wild should be the ultimate objective of all captive breeding programmes," IUCN Caring for the Earth, October 1991, p. 7).

¹⁰⁶ Transport of live cetaceans is highly stressful (see Small, R.J. and DeMaster, D.P. 1995. Acclimation to captivity: A quantitative estimate based on survival of bottlenose dolphins and California sea lions. *Marine Mammal Science* 11: 510-519). It can contribute to captive mortality. In addition, there have been two recent orca captures from the wild – in Japan in 1997 (five animals) and Russia in 2003 (two animals) (Fisher, S.J. and Reeves, R.R. 2005. The global trade in live cetaceans: Implications for conservation. *Journal of International Wildlife Law and Policy* 8: 315-340). All of these animals are now dead, the majority within months and the rest within a decade – see <http://www.orcahome.de/orcadead.htm>.

¹⁰⁷ Simon, M., Hanson, M.B., Murrey, L., Tougaard, J., and Ugarte, F. 2009. From captivity to the wild and back: An attempt to release Keiko the killer whale. *Marine Mammal Science* 25: 693-705.

¹⁰⁸ Brower, K. 2005. *Freeing Keiko: The Journey of a Killer Whale from Free Willy to the Wild*. Gotham Books, New York, 320 pp.

¹⁰⁹ Couquiaud, L. 2005. A survey of the environments of cetaceans in human care: Introduction. *Aquatic Mammals* 31: 283-287 – "Husbandry and medical care were learned empirically over the years by trainers and veterinarians," p. 283.

¹¹⁰ The three youngest captive orcas were less than one year of age at the time of this report's publication: Makaio at SeaWorld Florida, Adán at Loro Parque, and Moana at Marineland Antibes.

¹¹¹ Davis, S.G. 1997. *Spectacular Nature: Corporate Culture and the Sea World Experience*. University of California Press, Los Angeles, 313 pp.