

OBSERVATIONS OF DISPARITY BETWEEN
EDUCATIONAL MATERIAL RELATED TO KILLER
WHALES (*ORCINUS ORCA*) DISSEMINATED
BY PUBLIC DISPLAY INSTITUTIONS AND THE
SCIENTIFIC LITERATURE

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ABSTRACT

All U.S. and Canadian marine mammal parks holding at least one killer whale (*Orcinus orca*) were surveyed by telephone, mail, the Internet or personal visit to ascertain information disseminated to the public concerning longevity estimates and other information for this species. When available, other attributable literature and public statements were included in the survey. Responses are given for each marine mammal park that responded. These data were then compared with the constitution of the Society for Marine Mammalogy (SMM), professionally recognized standards for content of education and conservation programs as described by the American Association of Zoos and Aquariums (AZA) and the Alliance of Marine Mammal Parks and Aquariums (the Alliance) and the most recent scientific literature to determine whether a disparity existed between public explanations of killer whale life spans and recent scientific literature.

All educational material derived from the four Sea World marine parks, Marineland of Ontario, and the Miami Seaquarium contained longevity information that significantly and consistently contradicted recent scientific literature. Marine World Africa USA and the Vancouver Public Aquarium provided information generally consistent with the literature. Possible rationales for providing inaccurate information, implications for meaningful discourse on related topics and reliability of other information provided by marine parks are discussed.

Key words: killer whale, longevity, life span, survival, captivity, husbandry, marketing, habitat.

*Author list is preliminary. Its finalization is contingent on a final consult with the organizations which some of the authors represent.

In recent years many zoo and aquarium professionals and critics have called for those institutions to turn away from exotic, charismatic species and focus instead on community education programs aimed at protecting local fauna and habitats (Norton, et al., eds. 1995). Additionally, the capture and maintenance of marine mammals in captivity for purposes of public display and scientific research remains controversial (e.g. Cowan 1992; Hoyt 1992; Morton, 1994; Riley 1993). Significantly reduced life spans for captive marine mammals, if established scientifically, would pose an important factor in that debate.

One of the most important justifications for the public display of marine mammals is the educational rationale, i.e. that spectators receive bona fide, scientifically accurate information about the species on display. This educational component of marine parks was mandated by an amendment to The Marine Mammal Protection Act of 1972 (MMPA).

The MMPA was amended in 1988 to require, among other things, that a permit be issued for public display purposes only to applicants that offered a program for education or conservation that is based on “professionally recognized standards of the public display community”, and that is acceptable to the Secretary (i.e. Secretary of Commerce or Interior, depending on the species involved).

The MMPA was amended substantially on April 30, 1994. The requirement that the education or conservation program be acceptable to the appropriate Secretary was eliminated. These 1994 Amendments require only that persons holding marine mammals for purposes of public display, or requesting issuance of a permit to capture or import a marine mammal for purposes of public display, must offer a program for education or conservation purposes that is based on professionally recognized standards of the public display community. Since there were no published professionally recognized standards for education or conservation programs, this requirement essentially relies on self-regulation. The National Marine Fisheries Service (NMFS), therefore, asked the American Zoo and Aquarium Association (AZA) and the Alliance of Marine Mammal Parks and Aquariums (the Alliance), as organizations that together represent approximately 80 percent of the public display facilities holding marine mammals, to identify the standards on which their members base their education and conservation programs, to allow holders to use these standards, as published in the Federal Register, as a reference instead of listing such standards repeatedly.

As published in the Federal Register of September 30, 1994 by NMFS, the AZA has included the following among the professionally recognized standards of the public display community on which their members have based their education and conservation programs:

1. Education must be an element of the mission statement of the institution.

2. All institutions must have structured education programs, including a written education plan.

3. The education program should be under the direction of a paid professional trained in educational programming.

4. Education programs should be evaluated on a regular basis for effectiveness and content and current scientific information included.

The Alliance has likewise identified the following among the professionally recognized standards of the public display community:

1. Education programs about marine mammals must promote an improved understanding of and an appreciation for these animals and their ecosystems.

2. Education programs about marine mammals must offer multiple levels of learning opportunities for visitors to expand their knowledge about these animals.

3. Education programs about marine mammals must present information about these animals, their ecosystem, or marine wildlife conservation that is based upon the best current scientific knowledge.

NOTE: The best current scientific knowledge refers to information based on the growing body of scientific research about marine mammals science [sic] and the basic knowledge that is professionally recognized by relevant disciplines, such as biology, physiology, anatomy, veterinary medicine, and/or animal behavior science.

In addition, Article II of the Constitution of the Society for Marine Mammalogy (SMM), states in part:

The objectives of the Society for Marine Mammalogy are to:

(1) evaluate and promote the educational, scientific and managerial advancement of marine mammal science;

METHODS

As a means of evaluating the manner in which these standards have been practiced by the members of the marine park community¹ and to evaluate the educational advancement of marine mammal science as represented by marine mammal parks², (many employees of most marine mammal parks are also members of SMM) a survey was conducted of the five U.S. and Canadian marine mammal public display institutions holding at least one killer whale (the four Sea World parks were considered to be one entity) to determine their educational content regarding the question: How long do killer whales (*Orcinus orca*) live? This question is commonly asked by students, teachers, and the public at large,

¹see No. 4 of the AZA standards and No. 3 plus NOTE for the Alliance standards, both listed above.

²see Article II (1) of the Constitution of the Society for Marine Mammalogy.



and the answer provides insights into a wide range of other questions, including maturation rates, birth intervals, multi-generational genealogies, reproductive life spans, population growth rates, sexual dimorphism and the possible social roles of older, post-reproductive females. A comprehensive answer may also illuminate any difference in longevity between captive killer whales and those living in natural habitats. Other information received in the course of the survey was also evaluated for scientific validity.

The survey was conducted by telephone, by mail, over the Internet, by personal visit and by reviewing literature either distributed by the marine parks or in which statements attributed to representatives of the marine parks appeared.

These results were first compared with the most current and accepted scientific papers that attempt to answer the question of longevity for killer whales. The scientific literature used to determine the best current scientific knowledge included: 1) Report to the International Whaling Commission (Special Issue 12), by Olesiuk, Bigg and Ellis (1990); 2) *Killer Whales*, by Ford, Ellis and Balcomb (1994); 3) Survival of five species of captive marine mammals, by Small and DeMaster (1995a); 4) Acclimation to captivity: a quantitative estimate based on survival of bottlenose dolphins and California sea lions, by Small and DeMaster (1995b); and 5) A comparison of survival rates for captive and free-ranging bottlenose dolphins (*Tursiops truncatus*), killer whales (*Orcinus orca*) and beluga whales (*Delphinapteras leucas*), by Woodley, Hannah, and Lavigne (1994).

RESULTS

Responses of marine parks

Longevity of killer whales

Marineland of Ontario, Niagara Falls, Ontario, Canada

A booklet called *Marineland Educational Manual*, distributed in 1995, contains the following:

It is believed that the Killer Whale may live for up to 35 years.³

Marine World Africa USA

In *A Closer Look at the Animals*, published by Marine World Africa USA (1995), under the heading 'Life Expectancy' the following is found:

³An almost identical *Marineland Educational Manual*, distributed in approximately 1991, stated "Killer Whales may live up to 50 years".

Life Expectancy: 50 to 75 years.

Miami Seaquarium, Miami, Florida

In response to a telephone inquiry, the spokesperson at Miami Seaquarium replied that no printed educational information would be mailed, but they would answer questions by phone. The longevity estimate for killer whales was stated to be 25 to 35 years.

Sea World

Sea World research biologist Dr. Daniel Odell,⁴ in an article in the children's educational curriculum book *Getting to Know the Whales*, edited by Lawrence Wade (1995), states:

The most recent scientific studies suggest that a killer whale's life span is between 25 and 35 years regardless of where it lives. It's important to remember field researchers have been studying killer whales for only 20 years. It's pure speculation when they conclude these animals may live to a maximum of 50 to 60 years.

Identical longevity estimates were stated in *The Facts About Sea World's Killer Whales*, by Sea World, Inc., (1993), prepared by the Sea World Corporate Zoological Dept.; *The Killer Whales Information Booklet*, by the Sea World Education Department (1994), (available over the Internet); a letter addressed to: "Dear Anheuser-Busch Employee/Wholesaler" on the occasion of the release of the film *Free Willy* (Busch Entertainment Corp. 1993); the Sea World Education Department World Wide Web site; the Shamu information line (1-800-23-SHAMU); and *A Discussion of Killer Whale Longevity*, Issue Backgrounder, by the Sea World Foundation (SWF) Education Department (1994), which begins:

While it is important to note that research into cetacean life spans continues and existing methods for estimating ages are not perfect, the most recent and reliable scientific studies indicate the *maximum* [emphasis theirs] length of time a killer whale could expect to live in the wild is between 25 and 35 years. Perhaps as important, killer whales cared for in properly and professionally run oceanariums *mirror and someday will likely exceed that potential life expectancy* [emphasis theirs].

In a letter from Busch Entertainment Corporation to Mr. Fay Brown dated

⁴Dr. Odell is the current Chair of both the Conference and Education committees of the Society for Marine Mammalogy.

October 22, 1993, concerning the killer whale named Corky at the San Diego Sea World, John B. Roberts states in part (Roberts 1993):⁵

Corky has been in the care of humans for almost 24 years, and the most recent scientific studies suggest she is in the later years of her life. Science shows killer whales live to be 25-35 years of age whether they live in the wild or are cared for by humans. Corky is nearly 30 years old, and while her routine medical exams show she's in good health, she is an older animal. Corky's ability to fend for herself in a competitive and uncontrolled world with pollution, parasites, disease and the need to hunt for food is questionable.

Vancouver Public Aquarium

An *Information Sheet* distributed by the Vancouver Public Aquarium provides the following:

- field studies in B.C. suggest that females may live to a maximum of 70-80 years and males 50 years.
- average life expectancy estimated at 29.2 years for males and 50.2 years for females.

Table 1. Results of inquiry into longevity of killer whales (*Orcinus orca*) given by marine park.

Marine park	Response
Marineland, Ontario	up to 35 years
Marine World Africa USA	50-75 years
Miami Seaquarium	25-35 years
Sea World	25-35 years
Vancouver Aquarium	females, 70-80 years; males, 50 years

Current scientific literature

Longevity of killer whales

The scientific literature is unambiguous on the subject of longevity and survival rates of killer whales both in the wild and in captivity. Based on 14 years of field work by American and Canadian researchers, (Olesiuk, *et al.*, 1990) conclude:

⁵The letter was copied to August A. Busch III.

Females have a mean life expectancy of 50.2 years, typically give birth to their first viable calf at 14.9 years of age, produce an average of 5.35 viable calves over a 25.2 year reproductive lifespan (sic) and have a maximum longevity of about 80-90 years.

and

Males have a mean life expectancy of 29.2 years, typically attain sexual maturity at 15.0 years and physical maturity at 21.0 years of age, and have a maximum longevity of about 50-60 years.⁶

A definitive popular text on the natural history and genealogy of killer whales in British Columbia and Washington State is *Killer Whales*, published in 1994 by the University of British Columbia Press. In it, John K. B. Ford (Vancouver Public Aquarium), Graeme M. Ellis (Pacific Biological Station), and Kenneth C. Balcomb (Center for Whale Research) state:

The average lifespan [sic] of females appears to be about 50 years. However, from the number and age of offspring and descendants of some old females, we estimate that some may reach 80 years of age.

Male killer whales begin maturing at 12 to 14 years of age. Over the next few years, they grow very quickly and attain physical maturity at about 20 years. ...Although we cannot estimate the age of males from the number of their offspring, we know that some live to be at least 40 years old. Male longevity, however, seems to be less than that of females, averaging about 29 years.

In Woodley, *et al.* (1994) the authors state:

Killer whales – Appendix Tables A and B in Bigg *et al.* (1990) were used to estimate Ω [maximum life span] for female killer whales. From the sample of females last seen in 1987 for which estimates of birth year were provided, Ω was indicated to be 76 years (n = 101).

Captive vs. free-ranging longevity

According to Small and DeMaster (1995a):

Survival of the wild population Olesiuk *et al.* studied, based on approximately 250 non-calves, was significantly higher than our estimates for non-calf captive killer whales (0.976 vs. 0.938, $P < 0.001$).

⁶Data derived from the study population since 1987 have not been modeled to determine degree of resemblance to results obtained in this study. However, in November, 1995, one of the authors of that study observed that more recent data tend to confirm the estimates given in the 1990 paper (G. Ellis, pers. comm.).



Again according to Small and DeMaster (1995b):

Survival in captivity increased for the bottlenose dolphin (*Tursiops truncatus*), California sea lion (*Zalophus californianus*), Steller sea lion (*Eumetopias jubatus*), and white whale (*Delphinapterus leucas*) over the 5-yr period between 1988 and 1992 compared with estimates based on data through 1987 (Small and DeMaster 1995). Survival in captivity for killer whales (*Orcinus orca*), the only other species for which the comparison was made, remained the same.

The implication of the former statement by Small and DeMaster (1995a) is that longevity for captive killer whales is significantly less than for free-ranging killer whales, since survival rates are significantly higher in the wild. The implication of the latter statement by Small and DeMaster (1995b) is that survival for captive killer whales did not improve between 1988 and 1992.

DISCUSSION

Killer whale longevity

The information on killer whale longevity found in scientific literature is not accurately reflected in the educational programs of some marine parks. The estimates provided by Sea World, Marineland of Ontario and Miami Seaquarium employees for killer whale longevity are consistently and significantly incorrect. It is unlikely that the entire scientific staff at the four Sea World parks, Marineland and Miami Seaquarium are unaware of the scientific literature indicating much longer killer whale longevity than they assert, and yet even the Education Chair of the Society for Marine Mammalogy, a Sea World employee, provides inaccurate data. Widespread circulation of incorrect information, if unchallenged, may disrupt scientific discourse and thus impede the “advancement of marine mammal science” (see Constitution of Society for Marine Mammalogy, Article II, Purposes).

Comparison of captive longevity vs. free-ranging longevity

The implication that the captive setting is an improvement over natural habitats is often made (e.g. Odell 1995, Sea World Incorporated 1993). Extrapolating from the implications of this assertion, the whales at Sea World should survive at higher rates than in the wild. The scientific literature is clear that the contrary is true. It is worth noting that 12 killer whales have died at Sea World parks since 1986, ranging in age from one month to approximately 25 years, with nine having died in their teens (Source: Marine Mammal Inventory Report [MMIR], compiled by NMFS).

Further implications

Since Sea World is by a wide margin the largest marine mammal public display institution and produces by far the greatest volume of educational materials, most of the following implications pertain specifically to Sea World.

The consistency with which misleading information is dispensed by Sea World suggests that its content and expression may be mandated by corporate policy, as indeed a letter to Anheuser-Busch employees/wholesalers indicates (Busch Entertainment Corp. 1993). Consistent dissemination of incorrect information would seem to be risky, especially for a corporation that depends on the good will of the consumer for revenues, and could contribute to stress and morale problems for the scientific and educational staff who are required to carry it out. This raises the question of the reason or reasons for continuing to distribute specious estimates without regard for established scientific literature. (No attempt by Sea World to refute the scientific literature in a published paper is known to any of the authors.)

The popular acceptance of the image of Shamu, the happy performing killer whale, appears to be important to Sea World's marketing efforts (Hoyt 1992). An example of this promotional image in use by Sea World is a lavish advertising booklet inserted in the spring of 1995 into *The Mail on Sunday* (London, U.K.) carrying the logo of the Anheuser-Busch Theme Parks and announcing a new exhibit called "Shamu's Happy Harbor."

A general public awareness that the killer whales who are confined to tanks tend to die in their youth might contribute to the public's perception that the whales are neither healthy nor happy. It is possible that if accurate information about survival rates in captivity became widely known, the experience of attending marine parks might come to be perceived by the general public as acceptance and complicity in the mistreatment of whales and dolphins. This evolution of public opinion could redefine viewing performing killer whales into a distasteful, perhaps even a shameful, experience, and could in turn reduce attendance at marine parks and thus revenues at the gate. The morale of many of the thousands of marine park employees could also be affected if they were to discover the scientifically valid longevity estimates. Many marine park employees have themselves been led to believe that the whales that have died under their care were approaching their maximum life span anyway, and that they would have had a much more difficult life, and probably would have died even sooner, in their natural habitats (Busch Entertainment Corporation 1993).

The dorsal fin fallacy

This tendency to distort longevity estimates calls into question other asser-

tions from those marine parks that provide incorrect longevity estimates. Some marine parks, for instance, consistently claim or imply that flaccid dorsal fins are as prevalent in natural habitats as in captivity. For example, in 1995 the big screen pre-show Killer Whale Quiz at the San Diego Sea World asked the following question:

Why are some killer whale dorsal fins straight while others are not?

The correct answer as told to spectators was:

All killer whale dorsal fins are uniquely different.

Following the answer the voice-over narration goes on to say:

Dorsal fins are not made of bone or cartilage, but rather a fibrous connective tissue called collagen. Veterinarians believe that height, weight and genetics all play a part in the straightness or droopiness of a killer whale's dorsal fin. The shape of a dorsal fin has nothing to do with the mood of the animal or how he feels. Just as all of us are born with different sizes and shapes of body parts like noses or ears, [photos of noses and ears are flashed on the screen] killer whales all have different dorsal fins both in the wild and in marine zoological environments. [A video of a droopy dorsal fin in the wild is briefly shown.] In fact, researchers currently identify individual whales in the ocean by their dorsal fins. [An illustrated identification guide depicting a subpod of L pod of Washington State's Southern Community of orcas is shown on the screen. There are over ninety whales, including sixteen fully adult males in the ID guide, all with straight dorsal fins.]

In photographs of more than three hundred killer whales inhabiting the waters surrounding Vancouver Island, B.C., fewer than 1% of the whales has a droopy dorsal fin (Ford, *et al.* 1994). Adult male killer whales in captivity who survive the onset of maturity invariably exhibit droopy dorsal fins. Smaller female dorsal fins usually bend over after a few years of captivity (Hoyt 1992). The only logical conclusion is that conditions of captivity play a far greater part than height, weight or genetics in the droopiness of a killer whale's dorsal fin.

The habitat fallacy

There are, however, more serious cases of misleading information contained in claims made by marine parks. According to Dr. Odell of Sea World (1995):

Our killer whales live in habitats where the water quality and temperature are carefully monitored and controlled. Unlike killer whales in the ocean, those at Sea World are not forced to contend with dangers such as shortages of food, parasites and threats from humans. In addition, our veterinarians perform

regular checkups during which they evaluate the animal's health. At Sea World, the killer whales receive a balanced, nutritious diet, and we make sure their day includes plenty of exercise.

By this logic, all whales (and perhaps all animals) might best be removed from their natural habitats. No consideration is offered in this assessment of the loss to the animal of the real habitat in which killer whales have evolved for millions of years, consisting of vast and dynamic oceanic expanses, the presence of myriad other species, and the intensely bonded, multi-generational family and social lives typical of the species. *Funktionslust*, the pleasure taken in what one can do best—the pleasure a cat takes in climbing trees, or the pleasure a killer whale may take in long distance swims with family members or the pursuit of a tasty salmon—is not taken into account when marine parks extol the virtues of dependence on human care in relatively miniscule concrete environments. Boredom in confinement is also not considered, though it is the probable typical condition of captive cetaceans, and may decrease the likelihood of survival (Masson and McCarthy 1995).

A similar suggestion is made in the brochure *The Real Story on Killer Whales* (Sea World Incorporated 1993), which states:

Habitats...Sea World is committed to maintaining the largest and most sophisticated marine mammal habitats in the world. Water in these facilities is continually monitored, chilled, filtered and cleaned. Water in all Sea World habitats far exceeds strict government requirements.

In discussions of the need for conservation of species and ecosystems, the term “habitat” conveys an essential concept that refers to natural habitats (Hancocks 1995). The tanks at Sea World are not natural habitats, and are not “the largest and most sophisticated marine mammal habitats in the world,” if, for example, the range of any known community of killer whales is considered for comparison. Such a statement redefines the word to include only artificial enclosures, and thus ignores and conceptually devalues real habitats, and distorts the meaning of a word that is vital in efforts to protect natural habitats, as the word is correctly used by Hancocks (1995):

We all know that the fascination people might have for mice, or pronghorns for that matter, can be an essential hook for attracting attention to the habitat of the animal and to the interrelationships between all components of that habitat. In this way, zoos have enormous potential to be an influential means for educating people about the natural world.

If the term “habitat” refers to artificial enclosures exclusively, as in the quote from Sea World, then the above passage makes little sense. Far from educating people about habitats, the promotional literature from some marine parks



undermines the meaning of the word. A widespread and clear understanding of the concept of “habitat” is essential for communicating vital information about protecting and restoring real natural habitats, a crucial environmental issue as we move into the 21st century.

In another article in the same volume, Hancocks (1995) discusses this aspect of the misuse of “habitat” by zoos:

The language of the promoter is always suspect, often disingenuous. The word “habitat,” for example, has replaced “cage.” People hear about zoos building new habitats and putting animals from their collections into the new habitats, and draw the wrong conclusions when they hear zoos also openly boast that they are arks destined to save the earth's wildlife.

Such promotional hyperbole has a way of seeping into and corrupting the vernacular language. The same misuse of the term was recently repeated in a news article about a dolphin display at a gambling casino in Las Vegas that appeared in the *Los Angeles Times* on October 14, 1995. The word “habitat” was used five times in the article, each time referring only to the artificial enclosure at the casino. Such a message is, in effect, an anti-conservation message, contradicting scientific uses of the word and the professionally recognized standards of the public display community, as stated by the AZA and the Alliance.

Reintroduction proposals

Expanding on this misuse of “habitat”, and the resulting devaluation of natural habitats, the feasibility of phased release programs for captive killer whales is often criticized (Busch Entertainment Corp. 1993):

Release Projects...Any suggestion that an animal in our long-term care be released should be approached with a great deal of skepticism. Killer whales that have been living in man's protective care for an extended period would face great difficulties surviving in the wild. Experimental programs to release bottlenose dolphins have all ended in failure.⁷

Again, real natural habitats are devalued and made to sound threatening. Readers are asked to accept Sea World's unsupported assertion that captive killer whales would be placed in danger if they were returned to their natural habitats. A combination of the longevity fallacy and the habitat fallacy is contained in the previously cited letter from John B. Roberts, spokesperson for Busch Entertainment Corporation, in defense of Sea World's refusal to consider releasing the captive whale named Corky (Roberts 1993):

⁷Prior to 1993, at least four bottlenose dolphins held for between two and eight years, and a pilot whale held for eight years, had been successfully released (Balcomb 1995).

Science shows killer whales live to be 25-35 years of age whether they live in the wild or are cared for by humans. Corky is nearly 30 years old, and while her routine medical exams show she's in good health, she is an older animal. Corky's ability to fend for herself in a competitive and uncontrolled world with pollution, parasites, disease and the need to hunt for food is questionable.

The core assertion here, that Corky is an older animal, is demonstrably incorrect. She is an adult, with another twenty years longevity (to reach mean life expectancy) and possibly more than 50 years (if she were to reach maximum longevity). And once again the “competitive and uncontrolled” natural world is cast in a negative light. The repeated assertion of similar misleading statements hinders productive communication and the advancement of marine mammal science on topics related to habitat protection, longevity, conditions of captivity, or reintroduction options with, or even among, marine park representatives.

CONCLUSION

Recent scientific studies indicate that there is a high correlation between the conditions of captivity and early deaths for orcas held in marine parks. This conclusion is ignored and contradicted with inaccurate statements made by credentialed professionals in the employ of some marine parks. Rationales for this consistent disparity between longevity estimates for killer whales by Sea World, Marineland of Ontario and Miami Seaquarium vis-à-vis the scientific literature are apparent. The economic disadvantages for marine parks of widespread public awareness of accurate information could be significant. It is estimated that about 70% of the gross income received at the four Sea World parks is due to the public's attraction to killer whale shows. Approximately 9 to 10 million people purchase tickets at a Sea World park each year. Most of those customers purchase food, beverages, toys and other gifts, bringing their total expenditure to around 400-500 million U.S. dollars per year (John Hall 1995). The pattern of dissemination of incorrect information described here may be linked to these economic incentives.

The general public and in particular the educational community have recently shown a high and increasing interest in the natural history of killer whales. As reported in the Federal Register, the Association of Zoos and Aquariums and the Alliance of Marine Mammal Parks have described their obligation to provide accurate educational and conservation-oriented information about the species. The Society for Marine Mammalogy has stated in its constitution that one of its purposes is to “evaluate and promote the educational, scientific and managerial advancement of marine mammal science”. The natural habitats of killer whales are in need of attention in order to maintain viability for the species and overall biological productivity. The record indicates that some marine mammal public display institutions have disregarded their stated obligation to



educate the public about the species' natural history and to encourage conservation efforts, and instead have presented and widely distributed significantly inaccurate information that may produce the opposite effect.

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