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Orcinus Orca in Captivity: Behavioral and Physiological Effects

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Abstract. The captivity of orcas has been a controversial topic for decades, with significant ethical, behavioral, and physiological concerns. While marine parks promote orca shows as educational experiences, orcas often display abnormal behaviors, including stereotypic behaviors and social disruptions, as well as experience a range of health problems, such as dorsal fin collapse and compromised immune systems. This article examines the history of orca captivity, the profound impact it has on their natural behaviors and health, and the latest research and case studies that illustrate the detrimental effects of such confinement. By exploring alternatives to captivity, such as marine sanctuaries and rehabilitation programs, we can move towards more ethical solutions that prioritize orca welfare. This article also addresses the growing body of scientific evidence calling for the end of orca captivity in favor of humane alternatives that align with conservation and public education efforts. Emerging alternatives, such as marine sanctuaries and rehabilitation programs, provide more humane options that allow orcas to live in the environments that are closer to their natural habitats. By encouraging public education through innovative technologies like virtual and reality, the article emphasizes the importance of shifting away from traditional captivity. Ultimately, this paper advocates for the future welfare of orcas, promoting conservation efforts and ethical practices that respect these remarkable marine mammals.

Keywords: Captivity, Ethical, Physiological.

1. Introduction

The captivity of orcas has long been a point of debate within the fields of marine biology, animal ethics, and conservation. Recent research has provided further insights into the behavioral and physiological effects of captivity on orcas. Studies have shown that captive orcas experience significantly high levels of stress hormones, which correlate with the development of stress-related illnesses and abnormal behaviors [1]. Advances in technology, such as the use of non-invasive monitoring tools, have allowed researchers to better understand the physiological changes that occur in captivity, leading to a growing consensus that the welfare of captive orcas is severely compromised [2]. The ethical considerations surrounding orca captivity are increasingly being debated. Animal rights organizations argue that the physical and psychological harm inflicted on captive orcas outweighs any potential educational or conservation benefits. They advocate for the end of orca captivity and the establishment of marine sanctuaries as a more humane alternative [3]. On the other hand, proponents of captivity argue that orcas in captivity serve as ambassadors for their species, raising awareness and fostering a connection with the public. However, the growing body of scientific evidence challenges the validity of these arguments, leading to calls for legislative changes and a reevaluation of the role of marine parks [4]. The following article investigates the significant behavioral and physiological impacts captivity has on orcas and explores emerging alternatives to the practice.

2. Orca Biology and Natural Behavior

Orcas, or killer whales, are highly social animals with diverse behaviors and complex social structures. In the wild condition, they live in matriarchal pods, often composed of multiple generations. They communicate using a sophisticated system of vocalizations, each pod has its language system and engages in cooperative hunting strategies. Orcas are also known for their intelligence, comparable to

apes, and their ability to form deep social bonds. These biological characteristics make orcas particularly vulnerable to the constraints and stressors of captivity, where their natural behaviors are often suppressed [5].

Tilikum, perhaps the most famous captive orca, is a prime example of the severe impacts of captivity. Tilikum was captured on the coast of Iceland in 1983, Tilikum spent over three decades in captivity, during which he was involved in killing three people. His story was composed in the documentary Blackfish, which brought widespread attention to the consequences of keeping orcas in captivity. Tilikum exhibited numerous signs of psychological distress and huge mental health problems, including aggressive behavior and repeated involvement in fatal incidents, which are rare in wild orcas [4]. His case has sparked public outcry and significantly contributed to the ongoing debate over the ethics of orcas and other cetaceans' captivity.

Lolita, a southern resident orca, another well-known captive orca, has been held in the Miami Seaquarium for over 50 years. Captured in 1970, she has lived in one of the smallest orca tanks in the world, far removed from her natural habitat and her pod [3]. Despite public campaigns for her release, Lolita still remains in captivity, where she displays signs of stress and isolation [6]. Her case highlights the long-term psychological effects of captivity.

The history of keeping orcas in captivity began in the 1960s, driven by entertainment, education, and scientific research. Marine parks tried to attract large crowds with the appeal of these huge marine mammals, showcasing their intelligence and strength through performances. However, as public interest grew, so did concerns about the welfare of these animals. Early on, the mortality rates of captive orcas were high, leading to scrutiny and a re-evaluation of the ethics of orca captivity [4].

3. Behavioral Effects of Captivity

Orcas are highly social animals with complex behaviors and sophisticated communication systems. They live in stable, matriarchal pods, often made up of multiple generations. One of the most remarkable aspects of orca behavior is their use of vocalizations. Orcas communicate using a range of clicks, whistles, and pulsed calls, with each pod developing a distinct dialect. These dialects are unique and passed down through generations, acting like a "cultural signature" for each pod. In addition to vocal communication, orcas exhibit coordinated hunting strategies. Pods work together to hunt prey, using tactics that vary depending on the type of prey and location. Some orcas specialize in hunting fish, while others prey on marine mammals like seals. These coordinated behaviors demonstrate a high level of social cooperation and problem-solving. Orcas are also known for their emotional intelligence, forming strong social bonds and engaging in play, showing signs of empathy and grief when pod members die. The complexity of their social structure and communication highlights their intelligence and adaptability in the wild

3.1. Stereotypic Behaviors

In captivity, orcas frequently develop stereotypic behaviors—repetitive, invariant behaviors with no apparent goal or function. These behaviors, such as swimming in circles or incessantly rubbing against tank walls, are indicative of severe psychological distress [5]. Unlike the wild orcas, captive orcas lack the condition and stimulation of vast oceanic environments, leading to boredom and frustration. The repetitive nature of their environment, combined with a lack of social interaction and mental stimulation, contributes significantly to the development of these abnormal behaviors [7].

3.2. Social Disruption

Captivity fundamentally alters the social dynamics of orcas. In the wild, orcas maintain strong social bonds within their pods, often staying with their family members for the whole lifetime. However, in captivity, orcas are typically separated from their pods and forced to live with unrelated individuals. This unnatural grouping can lead to heightened aggression, social tension, and in some cases, violence.

The stress of these forced and unnatural social interactions is exacerbated by the limited space, where orcas cannot escape from conflicts, leading to physical and psychological harm.

3.3. Altered Behavior Patterns

Captive orcas exhibit behavior patterns that are rarely, if ever, observed in the wild. For example, some captive orcas have been documented displaying aggression towards humans, a behavior almost unheard of in wild populations. This aggression is often a result of frustration and stress caused by the restrictive and unnatural environment [3]. Additionally, captivity disrupts natural behaviors such as hunting, which is replaced by the passive consumption of food provided by trainers. This loss of natural behavior further diminishes the orcas' mental and physical well-being [2].

4. Physiological Effects of Captivity

4.1. Health Issues

Captive orcas are easy to get health issues not commonly observed in their wild counterparts. One of the most visible signs of captivity is dorsal fin collapse, a condition where the fin droops to one side, affecting over 80% of captive males but less than 1% of wild males [8]. This condition is often attributed to the unnatural environment, including limited space for swimming and the effects of gravity in shallow tanks [6]. Additionally, captive orcas suffer from dental problems due to the stress-induced behavior of biting on tank walls and metal gates, leading to infections and chronic pain [4]. Other health issues include vulnerable immune systems, which make captive orcas more susceptible to diseases and infections [1].

4.2. Lifespan and Mortality Rates

The lifespan of captive orcas is significantly shorter than that of their wild counterparts. In the wild, orcas can live up to 60-70 years. However, in captivity, the average lifespan is drastically reduced, with many orcas dying before reaching 30 years of age. High mortality rates among captive orcas are often due to stress-related illnesses, poor health conditions, and inadequate veterinary care. These findings raise serious ethical concerns about the sustainability of keeping orcas in captivity [9].

4.3. Reproductive Issues

Reproduction in captivity poses additional challenges. Captive breeding programs of orcas often face difficulties such as low birth rates, high calf mortality, and the ethical concerns surrounding the use of artificial insemination. Female orcas in captivity often experience complications during pregnancy, and calves born in captivity have a significantly lower survival rate compared to those born in the wild [10]. These reproductive challenges not only raise questions about the viability of captive breeding programs but also underscore the broader ethical dilemma of keeping orcas in captivity for entertainment and commercial purposes.

5. Alternatives to Captivity

5.1. Sanctuaries and Rehabilitation

One of the most promising alternatives to traditional orca captivity is the establishment of marine sanctuaries. These sanctuaries offer a more natural environment where orcas can live in semi-wild conditions, with larger spaces and more opportunities for natural behaviors. While reintroducing long-term captive orcas to the wild poses significant challenges, sanctuaries provide a more ethical option for improving their quality of life. Rehabilitation programs can also play a role in transitioning orcas from captivity to these sanctuaries, with a focus on restoring their physical and psychological well-being [4]. Examples of emerging sanctuary projects include the Whale Sanctuary Project, which aims to provide a safe haven for former captive whales and dolphins. This initiative seeks to address

the physical and psychological harm caused by captivity while also offering opportunities for public education and research into whale rehabilitation. This approach also can reduce the accidental mortality of orcas. the incidence rate of ship striking accidents because the sanctuaries can effectively prevent the orcas get close to the shipping route.

5.2. Rehabilitation and Release Programs

While successful examples are rare due to the difficulty of reversing the effects of captivity, there are notable cases like Keiko, the orca featured in the film Free Willy, who was successfully rehabilitated and partially reintegrated into the wild, though challenges in full reintegration persisted. This approach highlights the potential for release when combined with comprehensive care.

5.3. Virtual and Augmented Reality

Technological innovations, such as virtual and augmented reality (VR and AR), offer new ways to engage the public without the need for live animal displays. VR and AR experiences can simulate the natural habitats of orcas, allowing people to learn about these animals and their behaviors in an immersive and educational way. These technologies have the potential to reduce the demand for live orca shows, shifting the focus towards conservation and ethical treatment of marine life. Companies like OceanX and The Wild Immersion have developed VR experiences that allow users to immerse themselves in the ocean environment alongside orcas. Users can "dive" with orcas, observing their natural behaviors and interactions within their habitats, providing a firsthand look at these majestic animals without the need for captivity.

6. Research Motivation and Future Directions

Ongoing research is crucial to deepening our understanding of the long-term effects of captivity on orcas and to developing more humane alternatives. Studies should continue to explore the physiological and psychological impacts of captivity, as well as the potential for rehabilitation and sanctuary solutions [2]. In recent years, many countries and regions have enacted laws banning or restricting orca captivity. For example, Canada passed the Ending the Captivity of Whales and Dolphins Act in 2019, which prohibits keeping cetaceans in captivity for entertainment purposes. Similarly, California's Orca Protection Act bans breeding orcas in captivity and performing orca shows. These legislative changes reflect growing public awareness and ethical concerns surrounding orca captivity, signaling a shift toward more humane alternatives. Public education campaigns focused on orca conservation and ethical treatment have gained momentum. Instead of relying on captive orca displays, organizations can promote documentaries, educational programs, and research on orca conservation. Films like Blackfish (2013) have played a crucial role in raising awareness about the detrimental effects of captivity, sparking a global conversation about the ethical treatment of orcas. Conservation initiatives in the wild, such as protecting orca habitats and addressing threats like pollution and overfishing, are also key components of a future where orcas can thrive without human captivity. By shifting focus to conservation efforts in the wild, marine parks and organizations can contribute positively to orca populations without relying on captivity for educational or entertainment purposes.

7. Conclusion

The captivity of orcas has had undeniable effects on their physical health and psychological of orcas. Years of scientific research highlight the drastic differences between the lives of wild orcas and those kept in artificial environments. Captivity alters their natural behavior, disrupts social structures, and leads to a range of health issues, all of which raise serious ethical concerns. This body of evidence calls into question the justification for continuing orca captivity, particularly for entertainment purposes. The future of orca welfare lies in shifting away from traditional captivity models toward more ethical and sustainable alternatives, such as marine sanctuaries, rehabilitation programs, and the

use of virtual technologies for public engagement and education. These alternatives not only provide orcas with a more natural living environment but also address the growing public and scientific demand for humane treatment. By focusing on conservation and welfare efforts, we can ensure that future generations of orcas are preserved and respected, free from the confines of captivity. The vision for the future must prioritize their well-being and embrace a world where orcas thrive in the wild, not in tanks.

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