

The Impact of Human Behavior on the Unnatural Evolution of Animals

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Abstract. For millions of years, natural selection has shaped the evolution of species, with environmental factors determining their survival and reproductive success. However, in recent centuries, human activities have introduced a new force—artificial evolution—driven by behaviors such as feeding, poaching, and habitat destruction. This review explores how these human interactions have reshaped the evolutionary trajectories of various species. One case study on fallow deer in Phoenix Park demonstrates how human feeding behaviors increased reproductive success by boosting fawn body mass, giving them a survival advantage. Additionally, the review examines how poaching has led to the decline of desirable traits, such as tusk size in elephants, due to the selective removal of individuals with larger tusks. The findings suggest that human actions are significantly influencing natural selection, with both intentional and unintentional effects. Understanding these impacts is crucial for addressing the long-term consequences of human-driven evolution and ensuring the preservation of biodiversity and ecosystem stability.

Keywords: Artificial Selection; Harvest of wild animal; Body mass; Breeding success; Supplemental Feeding.

1. Introduction

Natural selection has been the primary mechanism driving evolution for millions of years, with environmental factors shaping species' survival and reproductive success. However, in the last few centuries, human activities have introduced a new dynamic to evolutionary processes, one that is no longer dictated by nature alone but heavily influenced by human interaction. This shift has resulted in what many researchers refer to as "artificial evolution. Human actions—whether intentional or unintentional—are now a significant force in shaping the behavior, physiology, and genetics of animal species. Human feeding behaviors, often seen in tourist-heavy areas like national parks, can have unintended consequences on animal behavior and reproduction[1]. In a study conducted on a population of fallow deer in Phoenix Park, researchers observed that human feeding altered reproductive outcomes by increasing body mass in newborns, which, in turn, increased their chances of survival[1]. This study exemplifies how direct human intervention can affect natural selection processes in ways that would not occur without human presence.

Similarly, in captive breeding research at Mississippi State University, it was observed that body mass played a critical role in breeding success, with heavier males having greater reproductive success than their lighter counterparts[2]. Poaching and trophy hunting also play a significant role in shaping animal populations[3]. The selective removal of animals with phenotypically desirable traits, such as large tusks or antlers, can reduce these traits in future generations. This phenomenon is well-documented in species like elephants and deer, where poaching and hunting have caused a noticeable decline in tusk and antler size. These targeted removals disrupt natural selection by removing individuals who would otherwise have had a competitive advantage in terms of reproduction. Beyond direct interaction, human-driven habitat destruction and industrial activities influence animal evolution. The expansion of urban and industrial areas leads to habitat fragmentation, forcing animals to adapt or migrate. For example, black bears in North America have altered their foraging behaviors due to human-induced changes in resource availability[4]. This behavior change demonstrates how industrial activities can create long-term evolutionary shifts by altering the environment in which

animals live. Domestication also serves as an example of human-driven evolution. The domestication of animals, such as cats, was not a deliberate process but rather the result of human settlement and agriculture[5]. Wild animals that were better suited to coexisting with humans were more likely to survive and reproduce, eventually leading to the domesticated species. This unintentional form of artificial selection has had long-lasting effects on the genetics and behavior of domesticated animals. Despite the wealth of studies on the effects of human activities on evolution, much remains to be understood about the long-term consequences of these changes. Human-driven evolutionary pressures may have far-reaching implications not just for individual species but for entire ecosystems. As human development continues to encroach on wildlife habitats, it is crucial to understand the full extent of human impact on evolution. The motivation for this review stems from the growing awareness of how human activities are not only impacting animal behavior but also driving unnatural evolutionary changes across species. With the increasing overlap between human development and wildlife habitats, it is crucial to understand how human behaviors—ranging from unintentional feeding to deliberate poaching and industrial activities—are influencing the evolutionary dynamics of animals. The goal of this paper is to explore the various ways in which human interaction has become a significant factor in altering animal physiology, behavior, and genetic traits. By highlighting these impacts, this review seeks to provide insight into the long-term evolutionary consequences and the role humans play in shaping ecosystems beyond their natural course. The main idea of this review is organized into several key sections. The first section examines human feeding behavior and its effects on animal reproduction and survival, using case studies such as the fallow deer population in Phoenix Park and the captive breeding research at Mississippi State University. The second section addresses the issue of poaching and hunting, particularly how the selective removal of animals with desirable phenotypes, such as tusks or antlers, can result in shifts in population traits over generations. The third section explores the concept of domestication and how human development has driven the unintentional domestication of species, using the example of domestic cats. Finally, the paper examines the influence of industrial activities, focusing on habitat destruction and the resulting behavioral adaptations in wildlife, such as road avoidance and altered migration patterns.

2. Human Impacts on Wildlife: How Feeding, Poaching, and Industrial Activities Drive Behavioral and Evolutionary Change

Human feeding behavior often occurs in national parks or is done intentionally, and this could cause a disturbance in animal mating decisions and naturally born advantage[1]. One of the studies was conducted in Phoenix Park, which attracts approximately 10 million visitors each year. It is home to a herd of about 600 fallow deer. The research team used this wild population because, with less opportunity for deer to migrate and exclude all-natural predators present, they observed the deer behavior through great distances that tourists enter. The observers are not allowed to interact with the deer and remain passive. During the observation time, they will record the pack size and number of visitors interacting, the amount of time and length of the interaction, as well as the deer's begging behavior. This raises the question of if the mother deer's begging behavior for food is related to a reproductive advantage: the elevated birth weight of fawns[6]. The result shows fawns born to constant beggars were heavier than those born to occasional or rare begging females, mothers who beg consistently deliver fawns up to 300-500g heavier than the fawns of mothers with less frequency begging behavior. A natural advantage in heavier weight could lead to a more successful breeding chance, males with greater body mass compared to their competitors are likely to achieve higher breeding success. During the study conducted at the Mississippi State University Rusty Dawkins Memorial Deer Unit in Starkville, the research used both captive and wild-caught females, while all males were captive-raised [2]. They observed the deer in breeding pens which contained water and feeders. Their results confirm that relative body was an important factor when determining the breeding success of male deer, but this advantage is mainly restricted to the strategy of direct contest competition. Males with lower body mass face significant limitations on their breeding success. "Body mass is also linked to greater variability in success, likely due to its interactions with other

uncontrolled variables. In addition to the advantages in breeding success in males, the study shows an influence of body mass and risk of mortality in the late-winter survival bottleneck in both males and females. In most large ungulate species, adult females' survival is generally high, more stable, and less affected by environmental changes compared to juvenile or adult male survival. Data for this study were collected from two locations in Michigan's Upper Peninsula, referred to as the low-snowfall and mid-snowfall areas. These environments include predators such as the gray elf, coyote, and bobcat. The heavier body mass of deer in the snowfall study areas supports the idea of selective advantages for larger deer during longer winters. In addition, early environmental conditions can have long-lasting effects on the expression of adult phenotypes, including body mass and survival rate. Body mass influences individual ability and is closely linked to adult survival, there is a difference between sexes in the connection between juvenile mortality and adult body mass, males who survived from a herd, and males from herds with high juvenile mortality were lighter than those from herds with lower juvenile death rates [7-9]. In contrast, the female body did not decrease with higher juvenile mortality.

Sometimes humans unconsciously disturb the presence of animals, but some humans deliberately harm them without regard for their well-being. Human poaching of animal tusks or antlers has a severe impact on wildlife. This practice not only threatens the survival of targeted species, like elephants and deer but also disrupts natural ecosystems [3]. Human's obsession with animals' phenotype caused an evolution through the harvest of wildlife animals, the harvesting of phenotypically desirable animals from a wild population exerts selection pressure that can decrease the frequency of those desirable traits. Not only does their appearance change, but, individuals with a certain size, morphology, or behavior have a higher chance of being removed from the group named selective removal, this can lead to genetic changes if the selected phenotype has at least some genetic basis. For instance, sexually selected trait such as horns, tusks, and antlers are the trophies for hunting and poaching, and the population's response is to reduce weapon size or body size, body size or morphology can become the selective target of larger or more distinctive individuals, the population or even species, will reduce growth rate and attenuated phenotype. These harvests can impact sexual selection, as the group tends to remove individuals with traits such as large size or elaborate weapons. Active human interactions in the wildlife area can also lead to domestication, nowadays we have reliable food sources and human populations are beginning to rise, encouraging large settlements with naturally abundant food [5]. Human agriculture has created the first farm communities, and domestication is the result of pressure from human development as they intuitively try to stabilize their food sources. One of the best examples is cats, behavioral genes influencing domestication were initially selected based on the habitats of individual wildcats that were better suited for urban living. These genes were subsequently spread to different geographic areas, driven by human preference. Thus, cat domestication can be viewed as a collection of unnaturally selected alleles from various wildcat populations, combined into a composite.

Human industry can also be a disturbing factor for animals, human industry results in habitat loss, resource inaccessibility, and population subdivision, and reproduction is disrupted in areas of habitat destruction; additionally, reproductive rates are likely to decline and mortality rates increase in lower-quality habits near roads, and groups that live by human-industry heavy areas may promote road avoidance behavior or even migrate to other areas [10]. The extent to which human activities alter animal behavior and how these behavioral changes will influence ecosystem functions depends on the patterns and intensity of human disturbance. Such as chronic and widespread human disturbances (such as shifts in population densities, changes in food availability, or other changes to the physical environment) are more likely to cause lasting and long-term changes in animal behavior. For instance, black bears have been observed to rely more heavily on human-provided food sources during the period when natural food availability is low, likely due to increased hunger[4]. Disturbance during critical times or important locations, such as breeding seasons, migration routes, or essential resource sites, may have greater effects on population or ecosystems compared to disturbances of the same intensity occurring at other times or places. Although every species is connected to ecosystem

functioning, the behavior of certain species, such as keystone species or ecosystem, such as keystone species, are much more vital to the overall ecosystem. For instance, shifts in beaver foraging behavior could lead to significant changes in water distribution, with major effects on the ecosystem, whereas changes in the foraging habits of other rodent species may not result in noticeable ecological impacts [4]. As mentioned earlier, behavior-driven changes in species populations can significantly influence ecosystem function. While population declines are concerning from a conservation standpoint, species with unique ecological roles have a greater impact on ecosystem dynamics. Human activities can disrupt the environmental cues that animals rely on for decision-making, leading to what are known as ecological traps. In these situations, animals engage in behaviors that seem adaptive but are harmful, often resulting in population declines. For instance, Bison frequently forage on agricultural lands due to human-induced changes in resource availability. However, this choice exposes them to higher hunting risks, contributing to a nearly 50% population decline within a decade. On the other hand, ecological traps can also occur when animals fail to adjust their behaviors in human-altered environments. For example, natural antipredator strategies like grouping or schooling, which are effective against wild predators, can increase vulnerability to hunters or fishers in human-dominated landscapes[11,12]. Ecological traps can trigger demographic Allee effects, where maladaptive behaviors persist or intensify at low population densities, further driving population declines. Human activities that reduce local species abundance can also cause information-mediated Allee effects. At low densities, a lack of social communication can disrupt critical processes such as selecting breeding habitats or finding food, exacerbating population declines and raising extinction risks for already vulnerable species. On the other hand, the exchange of social information can sometimes help populations recover from downward demographic trends. While behaviorally driven Allee effects can have severe consequences for species populations, the ultimate impact on ecosystem functions will depend on the species' ecological role and its current population status. With increased advocacy, there is a growing awareness that human activities not only affect animal behavior but also drive unnatural evolutionary change across species. As the overlap between human development and wildlife habitats grows, it is critical to understand how human behaviors, from unintentional feeding to intentional poaching and industrial activities, affect the evolutionary dynamics of animals[11]. By analyzing these diverse aspects of human impact on animal evolution, this review aims to provide a comprehensive understanding of the scale and complexity of this issue. Ultimately, the findings are intended to encourage more responsible human interaction with wildlife, in hopes of minimizing further unnatural evolutionary pressures and preserving biodiversity.

3. Conclusion

This paper highlights the significant influence that human activities have on shaping the evolutionary trajectories of animal species. From intentional feeding practices to the selective pressures imposed by hunting and poaching, humans are altering natural selection in ways that would not occur without human intervention. The case studies of fallow deer in Phoenix Park and captive deer at Mississippi State University exemplify how human interaction can lead to changes in reproductive success, while poaching and trophy hunting have driven a decline in phenotypically desirable traits, such as tusk and antler size, in species like elephants and deer. Additionally, human development has led to the unintentional domestication of species, as seen in the case of cats, and industrial activities have forced behavioral adaptations in animals living near human-populated areas. The findings of this review suggest that human actions are not only disrupting natural ecosystems but also driving evolutionary changes that could have long-term consequences for biodiversity and ecosystem stability. These results underscore the importance of mitigating the negative impacts of human interaction with wildlife and promoting more responsible behavior in areas where humans and animals coexist. Despite the significant insights provided by this review, several limitations should be acknowledged. First, the research primarily focuses on specific case studies, which may not fully represent the broader range of species affected by human activities. Second, the long-term evolutionary consequences of human-driven changes are still not fully understood and require further study. Future research should aim to expand the scope of species studied and explore the genetic and ecological

impacts of human activities over longer periods. In doing so, we may better understand how to protect and preserve the natural evolutionary processes that are essential to maintaining biodiversity and ecosystem health.

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