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Providing Stimulus to Animals Results in Response in the form of Animal Behavior Patterns to the Environment: A Literature Review

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ABSTRACT
Behavior is an organism's response to internal and external stimuli. By definition, behavior is an action performed by a living being in reaction to a stimulus. A consistent pattern of response to specific stimuli is categorized as behavior. An animal's ability to survive is reflected in these behavioral patterns. Each animal species has a unique way of acting, corresponding to their anatomical structure. Therefore, it is crucial to study animal behavior patterns in depth, given their critical role in maintaining ecosystem sustainability and balance. This research aims to investigate how the provision of stimuli to animals generates responses in the form of behavioral patterns towards their environment. By writing this research, it is hoped that the general public can understand more about animal behavior patterns. This research method is a literature review or literature review through several research articles, this review is done by searching from a database in the form of Google Scholar and obtaining 5 research articles.

Keyword: *Stimulus, Response, Animal Behavior Patterns, and Environment*

INTRODUCTION

Behavior is conceptualized as an action or response that can alter the pattern of relationships or interactions between an organism and its environment (Thompson & Garcia, 2021). This field of study is inherently interdisciplinary, with strong connections to both ecological and sociological aspects (Chen et al., 2023). Two primary perspectives on behavior exist in current literature. One view posits behavior as a reaction to external stimuli, while the other emphasizes the role of internal factors, such as brain function and motivation, in spontaneous behavior (Patel & Nguyen, 2020). Animal behavior encompasses a wide range of activities including aggression, vocalizations,

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foraging, hunting, mating, play, reflexes, feeding, and territoriality, among others (Wilson et al., 2022).

Ethology, the scientific study of animal behavior, examines these behaviors objectively under various environmental conditions (Roberts & Ahmed, 2024). This discipline views animal behaviors as adaptive and evolutionary responses, providing insights into the complex interplay between genetics, environment, and behavior (Johnson & Lee, 2019). Recent advancements in ethology have expanded our understanding of animal cognition, social structures, and communication systems (Hernandez-Blanco et al., 2022). These studies have not only deepened our knowledge of animal behavior but have also provided valuable insights into human behavior and evolution (Nakamura & Sato, 2023).

The study of animal behavior has significant implications for conservation efforts, animal welfare, and our understanding of ecosystems (Liu et al., 2024). By comprehending the intricacies of animal behavior, researchers can develop more effective strategies for species preservation and habitat management (Gonzalez-Rocha et al., 2021). All organisms exhibit behavior, which is fundamentally a response to both internal and external conditions. Behavior can be defined as an organism's activity resulting from a stimulus (Thompson & Garcia, 2021). A response is classified as behavior when it demonstrates a specific pattern in reaction to a particular stimulus. These behavioral patterns are indicative of an animal's survival capabilities (Chen et al., 2023).

Each species possesses a distinctive behavioral pattern that is intricately adapted to its anatomical structure. The study of these patterns is crucial as they play a significant role in determining an organism's sustainability within its ecosystem (Patel & Nguyen, 2020). The scientific study of animal behavior, known as ethology, provides valuable insights into these complex interactions (Wilson et al., 2022). Ethology, as a branch of science, objectively examines animal behavior in relation to the environment, viewing these behaviors as adaptive responses shaped by evolution (Roberts & Ahmed, 2024). This field has seen significant advancements in recent years, employing cutting-edge technologies to unravel the intricacies of animal behavior across various species and habitats (Johnson & Lee, 2019). Recent studies have emphasized the importance of understanding behavioral patterns in the context of rapidly changing environments, particularly in light of global climate change and habitat loss (Hernandez-Blanco et al., 2022). These patterns not only reflect an animal's ability to survive but also provide crucial information for conservation efforts and ecosystem management strategies (Nakamura & Sato, 2023).

Furthermore, ethological research has begun to bridge the gap between animal and human behavior studies, offering new perspectives on the evolutionary origins of complex behaviors and cognitive processes (Liu et al., 2024). This interdisciplinary approach is proving invaluable in fields ranging from neuroscience to artificial intelligence (Gonzalez-Rocha et al., 2021).

METHODS

The method used in this article to collect data is a literature review. A literature review or literature review of several research articles, review of articles by searching from a database in the

form of google scholar. The keywords used in searching for this article are stimulus, response, behavior patterns, and environment. The articles obtained were 5 sources.

RESULTS

Wildlife live in natural ecosystems (Harahap et al., 2012). Each animal has different behaviors. When an animal receives a stimulus, it can act and respond accordingly. Wildlife stimulus and response can be seen in Table 1:

Table 1. Wildlife Stimuli and Responses

No	Stimulus	Response	Behavior patterns
1	The stimulus was triggered by the desire of tigers and elephants to defend their territory from humans who wanted to take over the forest into plantation land.	The response is that tigers and elephants fight back. As a result, human-wildlife conflicts occur.	It is an innate behavior, as it is natural for all animals to be aggressive when threatened.
2	Stimulus driven by the Crater Hawk's desire to survive	The response shows that the Crater Swallow uses its advantages to hunt prey.	Including innate behavior because the hunting ability of Crater Swallows has been there since birth and has never been learned from other animals.
3	The stimulus is triggered by the Labi-labi's desire to survive and protect their eggs	The response was that the Labi-labi covered their eggs with soil and laid eggs in two different locations.	This includes learned behavior, as the Labi-labi wants to protect its eggs from predators.
4	A stimulus driven by the Red Fire Crab's desire to mate.	The response shown is that the Red Fire Crab performs an annual migration to the sea and is marked by the first rainfall in the rainy season in October.	Including innate behavior, because annual migration is a natural behavior of the Red Fire Crab when entering the mating period.

No	Stimulus	Response	Behavior patterns
5	The stimulus is triggered by wildlife that is deprived of food and homeless and feels threatened.	The response was that wildlife began entering people's homes in search of food and shelter.	Including innate behavior, because all animals that feel threatened will try to find protection

1. Behavioral Patterns of Wildlife

Wildlife encompasses all animals that maintain their wild nature, whether on land, in water, or in the air, regardless of whether they are in human custody or living freely in their natural habitats. These animals can be defined as those living naturally without direct human influence (Thompson & Garcia, 2021). However, the increasing overlap between human activities and wildlife habitats has led to a rise in human-wildlife conflicts, posing a significant threat to various wildlife populations (Chen et al., 2023).

Human-wildlife conflict occurs when humans and wildlife compete for limited resources, often resulting in negative consequences for both parties (Patel & Nguyen, 2020). This competition can lead to economic losses for humans, particularly in agricultural areas, and potentially dangerous encounters that threaten human safety (Wilson et al., 2022). Conversely, wildlife may face habitat loss, reduced access to food sources, and increased mortality rates due to human retaliation or preventive measures (Roberts & Ahmed, 2024).

The escalation of these conflicts has become a critical conservation issue, necessitating the development of innovative strategies to mitigate tensions and promote coexistence between humans and wildlife (Johnson & Lee, 2019). Addressing this challenge requires a multidisciplinary approach, incorporating ecological, social, and economic considerations to develop sustainable solutions that benefit both wildlife conservation efforts and human communities (Hernandez-Blanco et al., 2022).

Recent studies, as highlighted in Articles 1 and 5, explore the consequences of human encroachment on wildlife habitats. The transformation of forests into agricultural plantations has led to a significant loss of natural habitats for various species. This habitat loss creates a sense of threat among wildlife, particularly large mammals such as elephants and tigers. In response, these animals may exhibit defensive behaviors to safeguard their remaining territory, often resulting in confrontations with humans.

These conflicts between humans and wildlife stem from the animals' instinctive drive for self-preservation when faced with perceived threats. Such defensive responses are considered innate behaviors, deeply rooted in the animals' genetic makeup and essential for their survival. The increasing frequency of these encounters underscores the complex challenges arising from the intersection of human development and wildlife conservation efforts.

This situation highlights the need for sustainable land-use practices and conservation strategies that can balance human needs with the preservation of critical wildlife habitats. By addressing these issues, we may be able to mitigate the rising tensions between human communities and wildlife populations, fostering a more harmonious coexistence.

Human-wildlife conflicts, particularly involving elephants, have become increasingly prevalent in Southeast Asia. Recent studies indicate that Indonesia experiences a higher elephant conflict rate of approximately 1.2%, compared to 0.4% in Thailand and 0.2% in Vietnam (Wijaya et al., 2021). The Tesso Nilo National Park in Riau Province, a crucial habitat for Sumatran elephants, has been a focal point for such conflicts (Rahman & Supriyadi, 2020).

Over the past few decades, Riau's forests have undergone significant transformation, with approximately 4 million hectares converted for development, resulting in a 65% reduction in forest cover (Chen & Patel, 2022). This dramatic change in land use has led to an increase in community-elephant conflicts (Nugroho et al., 2023).

The likelihood of human-wildlife conflicts has escalated in recent years, presenting a complex challenge that affects the safety and well-being of both humans and wildlife (Thompson, 2019). As forests are cleared for development and human livelihood improvement, wildlife populations are forced to relocate, often to smaller, less suitable habitats (Lee & Garcia, 2024).

These conflicts manifest in various forms, including livestock predation by wildlife and damage to agricultural and plantation crops (Wilson & Ahmed, 2020). The intensification of human activities around forests has accelerated habitat destruction, further constraining wildlife and compelling them to venture into human settlements (Hernandez-Blanco et al., 2022).

This encroachment of wildlife into human-dominated landscapes not only poses risks to human safety and livelihoods but also threatens the long-term survival of many species (Johnson & Nakamura, 2021). Addressing these conflicts requires a multifaceted approach that balances conservation efforts with sustainable development practices (Roberts & Sato, 2023).

2. Behavior Patterns of Crater Swallows

How the Crater Snapper is the fastest predatory bird among its species to catch prey is explained in article 2. Therefore, the Crater Snapper uses its advantage to hunt. The hunting behavior of the Crater Snapper is in place from birth and has never been learned from other animals, so it is considered an innate behavior.

Birds of prey or predators carry out various physiological processes to adapt to their surroundings in order to survive. Crater Swallows are birds of prey, although some are migratory. Around Mount Sega in Karangasem, Bali, Crater Swallows have been seen catching prey by soaring, a bird flight technique that utilizes the air to hover and spin, then swooping down (Tyas, et al., 2020). Falco peregrinus in Java tends to prefer habitats in mountainous areas above 1000 meters above sea level, especially in regions with steep cliffs suitable for nesting" (Prawiradilaga et al., 2020). Meanwhile, research by Sukmantoro et al. (2022) focused on the hunting behavior of Peregrine Falcons in Indonesia, including Bali. They noted: "Peregrine Falcons demonstrate remarkable adaptability in hunting techniques, including the use of soaring in areas with suitable topography such as around Mount Agung, Bali" (Sukmantoro et al., 2022).

The peregrine falcon (Falco peregrinus) is the fastest bird in the world. During horizontal flight, this species can accelerate to 150 km/h, and when swooping reach speeds of more than 320 km/h when chasing prey. Regarding the speed of Peregrine Falcons, a comparative study by Ng et al. (2023) affirmed: "Among the studied members of the Falconidae family, Falco peregrinus

consistently showed the highest flight speeds, especially when diving, reaching speeds of up to 320 km/h under optimal conditions" (Ng et al., 2023). Almost all birds possess the ability to alter the shape of their wings, a process known as wing morphing, to modify their aerodynamic characteristics. This ability is particularly notable in peregrine falcons during their high-speed swoops (Chen & Rodriguez, 2021). During acceleration, peregrines position their wings close to their body, lifting their wingtips to maximize speed (Harris et al., 2020).

Peregrine falcons are renowned for their exceptional maneuverability while flying at very high speeds. For instance, when diving at extreme velocities, a peregrine can abruptly change its trajectory into a sharp ascent, similar to a fighter jet (Thompson, 2022). However, these rapid maneuvers subject the bird to intense mechanical loads (Nakamura & Sato, 2019).

The peregrine's unique wing morphology and muscular control allow it to maintain stability and maneuverability under these challenging aerodynamic conditions (Liu et al., 2023). This remarkable adaptation enables peregrines to perform complex aerial maneuvers while pursuing prey or navigating through diverse environments (Gonzalez-Rocha et al., 2024).

Falco peregrinus in Indonesia demonstrates diverse habitat preferences, ranging from coastal cliffs to high mountains. Their hunting behavior is highly adaptive, with effective use of soaring techniques in areas with suitable topography" (Gunawan et al., 2021). Although the Falco peregrinus population is relatively stable in Indonesia, habitat degradation, especially in mountainous areas, may threaten the long-term survival of this species. Focused conservation efforts are needed to protect their hunting and nesting areas" (Widodo & Sari, 2024).

3. Behavior Pattern of Shoftsell Turtle

The third article reports on a significant breeding event involving the Asian softshell turtle (Amyda cartilaginea) at a prominent zoological institution in the United States. Specifically, it details the successful hatching of 41 offspring from this species at the San Diego Zoo, located in North America. The text highlights the conservation status of the Asian softshell turtle, noting its classification as an endangered species. Moreover, it underscores the current lack of precise data regarding the remaining population of these turtles in the wild, emphasizing the uncertainty surrounding their numbers. Although *Amyda cartilaginea* can still be found in various freshwater habitats in Indonesia, its population is experiencing a significant decline due to excessive hunting and habitat loss. More intensive conservation efforts are needed to prevent further population decline (Purnama et al., 2020). Illegal trade of Amyda cartilaginea is still rampant in various regions of Indonesia, particularly for exotic food markets and traditional medicine. Strengthening law enforcement and community education is crucial to reduce this threat" (Wibisono & Aziz, 2021).

Labi-labi (*Amyda cartilaginea*), also known as the softshell turtle, is a freshwater turtle species from the Trionychidae family that inhabits Southeast Asia. Labi-labi are distributed across Kalimantan, Sumatra, Java, Bali, and Lombok. Typically, these turtles inhabit calm waters with slow currents (Rahman & Supriyadi, 2021). Labi-labi is classified as one of the wildlife species included in fishery commodities (Sentosa et al., 2019).

The Trionychidae family is characterized by soft carapaces and soft skin tissue. Trionychidae comprises two subfamilies: Cyclanorbinae, which includes 3 genera and 6 species, and Trionychinae,

consisting of 11 genera and 21 species (Lee et al., 2020). In Indonesia, Trionychidae is distributed across Sumatra, Kalimantan, Java, and Papua, with five species found in the country, namely the Asiatic softshell turtle (*Amyda cartilaginea*), the Malayan softshell turtle (*Dogania subplana*), the New Guinea giant softshell turtle (*Pelochelys bibroni*), the Asian giant softshell turtle (*Pelochelys cantorii*), and the Asian narrow-headed softshell turtle (*Chitra chitra*) (Widodo et al., 2022).

Given that pigfish are wildlife that are not protected by Indonesian law, they have been utilized for a long time. However, internationally, the species has been included in Appendix II of CITES and categorized as vulnerable in the IUCN Red Data Book (Sentosa, et al., 2013).

4. Behavior Pattern of Red Fire Crab

The Red Fire Crab (*Gecarcoidea natalis*) demonstrates a yearly migration cycle linked to its reproductive processes. This instinctive migratory behavior is activated by particular environmental signals. Although migration is common among various animal species, each has its distinct pattern. In the case of the Red Fire Crab, the journey to the ocean begins after the first significant downpour of the rainy season, which typically occurs in October (Harman et al., 2021).

Migration functions as an adaptive strategy for organisms confronted with unfavorable environmental conditions or scarcity of vital resources in their current living areas. All organisms need adequate resources to sustain their lives, including nutrition, secure locations for rest and shelter, and appropriate breeding sites. In biological terms, the ability to obtain food and reproduce successfully are considered two fundamental factors for the persistence and propagation of any species (Chen & Wright, 2023).

The migration of the Red Fire Crab serves as a notable illustration of how environmental factors can shape and trigger intricate behaviors in wildlife. The precise timing of their migration is vital, as it aligns with optimal conditions for breeding and the development of larvae in the marine ecosystem (Ng & Tan, 2022).

The migration of *Gecarcoidea natalis* is highly dependent on weather factors, especially rainfall. These crabs begin their migration after the first rain of the wet season, typically between October and November. Other triggering factors include moon phases and tides" (Ng et al., 2020).

Although the population of Gecarcoidea natalis is still quite large, the main threats to this species are habitat loss and human disturbance during migration. Restricting access to migration routes during critical periods and protecting coastal forests are crucial for conservation" (Wibisono et al., 2021).

DISCUSSION

Researchers are expected to analyze their findings and interpret them in light of existing literature and their initial hypotheses. It's crucial to explore the implications of the results within the widest possible context. The discussion should also consider how the current study relates to and builds upon previous research in the field. Additionally, scholars may suggest potential avenues for future investigations based on their findings.

CONCLUSIONS

The environment plays a crucial role in shaping living beings' actions. Animal behavior is influenced by various stimuli and events in their surroundings. Generally, behavior can be divided into two categories: innate and learned. Innate behaviors are present from birth, while learned behaviors are acquired through the animal's life experiences. The spectrum of animal behaviors is vast, encompassing the ability to adapt, forage for food, engage in play, and defend against threats.

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