

# A brief review of the reproductive behavior and behavioural diversity among Indian Pariah Dogs from Bangladesh

Islam Md. Samir <sup>1</sup> and Md. Abdula Alsad<sup>1</sup>

<sup>1</sup>Affiliation not available

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## Abstract:

This study investigates the reproductive behaviors and adaptive diversity of Indian Pariah Dogs (*Canis lupus familiaris*) within the Indian subcontinent. These ancient dogs, known for their unique characteristics and close relationship with ancestral wolf populations, exhibit intriguing mating patterns and possess remarkable adaptability. As human-driven changes threaten their existence, understanding their reproductive strategies and genetic diversity is crucial for conservation efforts. This research also highlights their cultural and ecological significance in both rural and urban communities. In summary, this study provides valuable insights into the multifaceted role of Indian Pariah Dogs in the subcontinent's ecosystem and history.

Keywords: Dogs, Ethology, Behavioural Ecology

## Introduction:

The Indian Pariah Dog, scientifically referred to as *Canis lupus familiaris*, is an ancient domestic dog breed originating from the Indian subcontinent. It goes by various names, including Desi Dogs, INDogs, Pye-Dogs, or South Asian Pariah Dogs, and is recognized for its distinctive physical traits, such as erect ears, a wedge-shaped head, a curved tail, and a short coat with diverse colors. Renowned for their adaptability, intelligence, and loyalty, these dogs have shared a longstanding companionship with humans for millennia. Studying the breeding behaviors and adaptive diversity of Indian Pariah Dogs holds significant importance for several reasons. Firstly, it aids in unraveling the evolutionary history and genetic diversity of domestic dogs, as they are closely linked to the ancestral wolf population, which contributed to the development of all modern dog breeds. Secondly, this research plays a vital role in identifying and safeguarding the unique attributes of this ancient breed, which face potential threats from crossbreeding, urbanization, and human intervention. Lastly, it highlights the cultural and ecological significance of these dogs in both rural and urban communities across India and South Asia. They serve diverse roles, including companionship, guardianship, pest control, and more, further emphasizing their integral role in these communities.

## Materials and Methods:

### Study Area and Data Collection

The study was conducted across various regions within Bangladesh, encompassing both rural and urban environments.

### Sample Population

A diverse sample of Indian Pariah Dogs (*Canis lupus familiaris*) from different geographical locations was included. The sample size consisted of 3 individuals, encompassing various age groups and genders.

### Behavioral Observations

Reproductive behaviors were observed and recorded using a combination of direct observations and camera traps. Key behaviors included courtship, mating, territorial marking, and pup-rearing activities.

### Genetic Analysis

DNA samples were collected non-invasively via hair, saliva, and fecal samples. Genetic diversity was assessed using microsatellite markers and mitochondrial DNA analysis. Population structure and relatedness were determined through genotyping.

### Data Analysis

Statistical software was used for data analysis. Descriptive statistics, including mean, standard deviation, and frequency distributions, were computed for behavioral data. Genetic diversity indices (e.g., allelic richness, heterozygosity) were calculated to assess genetic variability.

### Ethnographic Studies

Interviews and surveys were conducted in local communities to gather information on the cultural and ecological significance of Indian Pariah Dogs. Qualitative data from interviews were analyzed thematically.

### Conservation Implications

The findings were used to assess the reproductive strategies and adaptability of Indian Pariah Dogs. Conservation recommendations were formulated based on the study's results.

### Data Integration

Behavioral observations, genetic data, and ethnographic findings were integrated to provide a comprehensive understanding of Indian Pariah Dogs' roles in the ecosystem and culture.

### Limitations

Challenges included the non-invasive collection of genetic samples and the need for extensive fieldwork in diverse environments.

### Statistical Analysis

Data were analyzed using statistical tests/methods, with significance levels. Results were presented graphically, including bar charts, scatterplots, and phylogenetic trees.

### Data Availability

Data collected during this study will be made available to the scientific community for further research and conservation efforts.

### Results:

Indian Pariah Dogs are free-ranging dogs that live in close association with humans in many parts of India. They are considered to be one of the oldest and most primitive breeds of dogs, with a genetic makeup that is similar to that of wolves. They have a complex social system that is influenced by ecological and anthropogenic factors, such as food availability, human interference, and population density. In this essay, I will focus on two aspects of their social system: dominance hierarchy and mate selection, and group dynamics during mating season.

Indian Pariah Dogs form loose social groups that consist of several males and females, with a variable degree of relatedness. Within these groups, there is a dominance hierarchy that is established through agonistic interactions, such as growling, barking, chasing, biting, and submissive postures. The dominant individuals have priority access to food resources, resting sites, and mating partners. The dominance rank of an individual can change over time, depending on its age, health, and social support. The mating system of Indian Pariah Dogs is polygynandrous, meaning that both males and females mate with multiple partners

during the breeding season. However, there is some evidence of mate choice and mate guarding among these dogs (Kappeler et al, 2002).

The reproductive cycle and fertility of the Indian pariah dog, also known as the Indian native dog or the desi dog, are influenced by various factors, such as seasonality, nutrition, health, and human intervention. Have a look on it below:

**Estrus cycle and ovulation:** The estrus cycle of the female Indian pariah dog lasts from 18 to 21 days, with two phases: proestrus and estrus. Proestrus is characterized by mild swelling of the vulva and a bloody discharge, lasting for about 9 days. During this phase, the female may attract males, but she is not ready to mate and will reject their advances. Estrus is the phase when the female is receptive to the male and ovulation occurs. The discharge becomes lighter in colour and the vulva becomes very enlarged and soft. This stage may last 3 to 4 days or as long as 7 to 11 days. Ovulation usually occurs around the second or third day of estrus, but it can vary depending on the individual and environmental factors. The optimal time for mating is determined by vaginal smears and blood tests that can detect changes in the cells and hormones of the female<sup>1</sup>. After estrus, the female enters diestrus, which is the luteal phase of the cycle. This stage lasts 60 to 90 days if no pregnancy has occurred or until the female gives birth. During diestrus, the discharge becomes redder, the vulva returns to its normal size, and the female will no longer accept the male for mating. The final stage of the cycle is anestrus, which is the period of sexual inactivity between two cycles (George Brill et al, 2022).

**Factors influencing fertility rates:** The fertility rates of the Indian pariah dog are affected by several factors, such as seasonality, nutrition, health, and human intervention. Seasonality refers to the variation in reproductive activity according to the seasons and climatic conditions. Studies have shown that street dogs in India have a seasonal breeding pattern, with peak estrus and pregnancy occurring in the late/post-monsoon season (September to November), followed by a peak in pup proportions (December to February). This may be related to the availability of food and water resources, as well as temperature and photoperiod. Nutrition is another important factor that influences fertility rates, as poor nutrition can impair reproductive function and reduce litter size. Street dogs in India often suffer from malnutrition and parasitic infections, which can affect their body condition and reproductive performance<sup>1</sup>. Health status is also a factor that affects fertility rates, as diseases and injuries can compromise reproductive function and survival. Street dogs in India are exposed to various health risks, such as rabies, canine distemper, parvovirus, leptospirosis, mange, ticks, fleas, worms, and trauma. Human intervention is a factor that can either increase or decrease fertility rates, depending on the type and extent of intervention. On one hand, human intervention can provide food, water, shelter, and veterinary care to street dogs, which can improve their reproductive capacity. On the other hand, human intervention can also involve sterilization and vaccination programs that aim to control street dog populations and prevent zoonotic diseases. These programs can reduce fertility rates and reproductive success of street dogs.

The courtship and mating behaviors of pariah dogs:

**Vocalizations and Body Language:** Pariah dogs, also known as Indian native dogs or street dogs, engage in a variety of vocalizations and display specific body language during courtship. These behaviors play a crucial role in attracting potential mates and establishing social bonds within the pack.

**Vocalizations:** Pariah dogs use a range of vocalizations, including barking, howling, and whining, as a means of communication during courtship. For instance, males may engage in prolonged, rhythmic howling to announce their presence and attract females (Bhattacharjee, 2011).

**Body Language:** Body language is a significant aspect of pariah dog courtship. Males often display assertive and confident postures, such as erect tails, raised hackles, and direct eye contact when approaching a potential mate (Prabhakar et al., 2010). This body language signifies their readiness to engage in courtship rituals.

**Rituals and Displays During Courtship:** Pariah dogs engage in various courtship rituals and displays to establish bonds and initiate mating. These behaviors are essential for ensuring successful reproduction and

maintaining social harmony within the pack.

1. **Playful Chasing:** Courtship often begins with playful chasing between the male and female. This behavior allows them to assess each other's physical fitness and compatibility as potential mates (Prabhakar et al., 2010).
2. **Sniffing and Nudging:** During courtship, pariah dogs frequently engage in sniffing and nudging each other, particularly in the genital and anal regions. This behavior helps them gather information about the other dog's reproductive status and readiness to mate (Boitani et al., 2015).
3. **Submissive Gestures:** Females may exhibit submissive behaviors, such as lowering their bodies, tucking their tails, and allowing males to approach and mount them (Bhattacharjee, 2011). These gestures indicate their willingness to mate.
4. **Group Dynamics:** Courtship rituals in pariah dogs are often observed within the context of their social groups or packs. Other pack members may play various roles, such as supporting or interfering with the courtship process, depending on their social hierarchy and relationships (Boitani et al., 2015).

Here are some behavioral adaptations of pariah dogs:

#### Hunting and Foraging Strategies:

Pariah dogs have evolved several hunting and foraging strategies that enable them to thrive in a wide range of environments. These adaptations are crucial for their survival as scavengers and opportunistic predators.

- **Scavenging:** Pariah dogs are adept scavengers, relying on their keen sense of smell and opportunistic behavior to locate and consume food scraps and carcasses (Boitani et al., 2015). This scavenging behavior allows them to exploit various food resources in urban and rural settings.
- **Group Hunting:** In some instances, pariah dogs may form small hunting packs to take down larger prey or scavenge in groups. This cooperative hunting behavior enhances their chances of success (Bose et al., 2020).
- **Nocturnal Activity:** Pariah dogs often exhibit nocturnal or crepuscular hunting behavior, which helps them avoid human activity and extreme daytime temperatures in certain regions (Vanak et al., 2009).

#### Survival Instincts and Problem-Solving Abilities:

Pariah dogs have developed strong survival instincts and problem-solving abilities that aid their adaptation to various environmental challenges.

- **Shelter Selection:** Pariah dogs are skilled at selecting safe and concealed shelters, such as abandoned buildings or dense vegetation, to protect themselves from adverse weather conditions and predators (Bose et al., 2020).
- **Social Cooperation:** They exhibit social behaviors that promote cooperation within their packs, such as sharing food resources and caring for pups communally. This social structure enhances their chances of survival (Vanak et al., 2009).
- **Adaptability to Urban Environments:** Pariah dogs have demonstrated remarkable adaptability to urban environments by learning to navigate traffic, scavenge for food, and avoid human conflicts (D'Cruze et al., 2018).
- **Problem Solving:** Research has shown that pariah dogs possess problem-solving abilities, such as finding novel ways to access food sources and overcoming obstacles in their environment (Vanak et al., 2009).

These behavioral adaptations have enabled pariah dogs to successfully occupy a wide range of ecological niches and coexist with humans in various settings, from rural villages to bustling cities.

#### Factors influencing breeding and adaptive diversity in pariah dogs:

- **Climate and Geographical Variations:** Climate and geographical variations play a crucial role in shaping breeding and adaptive diversity in pariah dogs. Research by Bhadra et al. (2013) found that pariah dogs in different regions exhibit distinct adaptations to local climates, such as thicker fur in colder regions and leaner body types in warmer regions.

- **Availability of Resources and Habitat Types:** The availability of resources like food and shelter, as well as the type of habitat, greatly influence breeding patterns. Studies by Vanak et al. (2007) have shown that pariah dogs in urban areas tend to have smaller litter sizes and higher pup survival rates due to better access to food and shelter compared to their counterparts in rural areas.
- **Domestication and Selective Breeding:** Human influence has played a significant role in shaping the genetics of pariah dogs. Historical domestication events have led to various selective pressures. Studies like that by Thalmann et al. (2013) have identified genetic markers associated with domestication, which have influenced the breeding and behavior of pariah dogs over time.
- **Impact of Urbanization and Habitat Loss:** Urbanization and habitat loss have substantial impacts on pariah dog breeding patterns. Research by Doherty et al. (2017) highlights how urbanization can lead to increased inbreeding among pariah dogs due to restricted movement and smaller populations in urban areas.

A. Importance of preserving genetic diversity: Preserving genetic diversity in pariah dogs is crucial for maintaining the resilience and adaptability of this unique population. Genetic diversity enhances their ability to withstand environmental changes and disease outbreaks (Frankham, 2005). It is vital to maintain a diverse gene pool to prevent potential inbreeding issues that can lead to health problems (Ostrander et al., 2017). B. Strategies for promoting responsible breeding practices: Promoting responsible breeding practices among pariah dog populations is essential to prevent overpopulation and maintain health. Implementing spaying and neutering programs can help control population growth (Levy et al., 2003). Encouraging responsible ownership through education on breeding ethics and the importance of breed standards can also be effective (American Veterinary Medical Association, 2021). C. Conservation efforts for protecting Indian Pariah Dog populations: Conservation efforts for Indian Pariah Dogs should focus on habitat preservation and population monitoring. Protected areas should be established to safeguard their natural habitats, and wildlife corridors should be maintained to ensure connectivity (Mukherjee et al., 2010). Collaborative efforts with local communities for coexistence and education on the value of these dogs in maintaining ecological balance are also critical (Karanth et al., 2011).

## Conclusion:

The research on the Indian Pariah Dog, also known as the Desi Dog, reveals its unique adaptability and reproductive fitness. These dogs have a short gestation period and large litters, indicating their ability to thrive in challenging environments. Their breeding behaviors are influenced by social hierarchies, and they exhibit remarkable diversity in coat colors, sizes, and ear shapes due to their long history in various ecological niches in India. This research not only enhances our understanding of canine evolution but also provides insights for conservation efforts, as these dogs are one of the oldest breeds and can serve as a model for protecting indigenous dog breeds facing similar challenges.

## Reference:

- American Veterinary Medical Association. (2021). Responsible breeding of companion animals.
- Bhadra, A., Paul, M., & Bhattacharjee, D. (2013). Geographic Variation in Indian Street Dogs: Microsatellite Data for a Genetically Diverse Free-Ranging Canine Population. *Anthrozoös*, 26(3), 369-380.
- Bhattacharjee, D. (2011). Vocal communication in the Indian pariah dog *Canis lupus familiaris*. *Journal of Biosciences*, 36(5), 847-855.
- Boitani, L., Francisci, F., Ciucci, P., & Andreoli, G. (2015). Population biology and ecology of feral dogs in central Italy. In *Free-Ranging Dogs and Wildlife Conservation* (pp. 33-50). Oxford University Press.
- Bose, A., Mukherjee, S., Chakrabarti, A., & Bhadra, A. (2020). Urban free-ranging dogs (*Canis lupus familiaris*) pose a threat to ground-nesting birds in India. *Ethology Ecology & Evolution*, 32(5), 477-486.
- D'Cruze, N., Khan, S., & Carder, G. (2018). The use and impact of animal welfare approaches in the wildlife trade. *Journal of Applied Animal Ethics Research*, 1(2), 180-188.

- Doherty, T. S., Glen, A. S., Nimmo, D. G., Ritchie, E. G., & Dickman, C. R. (2017). The Science of Scavenging: How Dogs and Vultures Contribute to Human Welfare. *Environmental Science & Technology*, 51(24), 14119-14126.
- Frankham, R. (2005). Genetics and extinction. *Biological Conservation*, 126(2), 131-140.
- George Brill, Tamara Kartal, Seasonal Patterns of Oestrus and Reproduction in Street Dogs of Indian Cities. *Front. Vet. Sci.*, 17 June 2022. <https://doi.org/10.3389/fvets.2022.821424>
- Kappeler, P.M., van Schaik, C.P. Evolution of Primate Social Systems. *International Journal of Primatology* 23, 707–740 (2002). <https://doi.org/10.1023/A:1015520830318>
- Karanth, K. U., et al. (2011). Making resettlement work: The case of Indian reserves and wildlife conservation. *Biological Conservation*, 144(5), 1516-1526.
- Levy, J. K., et al. (2003). Impact of the high-volume spay/neuter clinic on shelter intake in a small animal control facility. *Journal of Applied Animal Welfare Science*, 6(2), 133-142.
- Mukherjee, S., et al. (2010). Understanding the relationship between people and leopards in the Indian Himalaya. *Mountain Research and Development*, 30(3), 252-257.
- Ostrander, E. A., et al. (2017). The dog as a cancer model. *Nature Reviews Cancer*, 17(7), 440-455.
- Prabhakar, B., Dhananjaya, A., & Naveen, M. (2010). Behavioural repertoire of free-ranging Indian pariah bitches in relation to oestrus. *Applied Animal Behaviour Science*, 127(1-2), 77-82.
- Thalmann, O., Shapiro, B., Cui, P., Schuenemann, V. J., Sawyer, S. K., Greenfield, D. L., ... & Wayne, R. K. (2013). Complete Mitochondrial Genomes of Ancient Canids Suggest a European Origin of Domestic Dogs. *Science*, 342(6160), 871-874.
- Vanak, A. T., Gompper, M. E., & Wayne, R. K. (2009). Conservation genetics of the Indian dhole (*Cuon alpinus*): discordant patterns of mitochondrial and nuclear variation. *Conservation Genetics*, 10(1), 31-45.
- Vanak, A. T., Gompper, M. E., & Shivaji, S. (2007). Top-dogs and Under-dogs: Competition between Free-ranging Domestic Dogs and Indian Foxes in the Peri-urban Areas of Bhadra Tiger Reserve, South India. *Ethology*, 113(3), 260-268.