

## BEHAVIORAL PATTERNS AND COMMUNICATION STRATEGIES OF DOMESTIC AND FERAL CATS (*FELIS CATUS*) IN RAIPUR, CHHATTISGARH, INDIA

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### Abstract

The behavior of domestic and feral cats varies significantly depending on the degree of human association. This study examined behavioral activities and communication strategies of *Felis catus* in Raipur, Chhattisgarh, India, between December 2023 and September 2024. Seventy-two individuals (38 domestic and 34 feral) were monitored in residential areas, public parks, waste zones, and peri-urban edges using focal and scan sampling supported by ad-libitum observations. Behavioral variables included feeding, resting, locomotion, grooming, vocalization, aggression, vigilance, and social interaction.

Domestic cats showed strong human dependency and social comfort, spending most of their time resting ( $\approx 401$  min/day; 86.5%), grooming ( $\approx 18$  min/day), and expressing frequent vocal communication ( $\approx 7.4$  calls/day) such as meows and purrs. They also displayed more affiliative interactions. On the other hand, feral cats invested more time in foraging and movement ( $\approx 92$  min/day feeding;  $\approx 58$  min/day locomotion), demonstrated heightened alertness ( $\approx 27$  min/day), and exhibited more aggressive encounters ( $\approx 3.5$ /day). Their communication relied mainly on physical and chemical cues such as scent-marking, hissing, and posture, reflecting limited human tolerance and a stronger dependence on self-survival strategies.

The findings indicate that domestic cats follow a comfort-based behavioral profile shaped by human support, while feral cats exhibit adaptive behaviors driven by competition, vigilance, and survival pressures. These insights contribute to urban wildlife behavior studies and highlight the need for balanced management strategies for free-roaming cat populations in Indian cities.

**Keywords:** *Felis catus*, feral cats, domestic cats, urban wildlife behavior, communication patterns, Raipur, India

### 1. Introduction

This study was carried out in Raipur, the capital city of Chhattisgarh, located in central India at approximately 21.25°N and 81.63°E. Raipur extends over nearly 226 km<sup>2</sup> and represents a rapidly growing urban landscape that integrates residential colonies, commercial complexes, educational institutions, parks, water bodies, and peri-urban agricultural stretches. The city has undergone significant infrastructural expansion in the last decade, resulting in increased waste production and food availability that supports free-ranging animal populations, including domestic and feral cats.

Raipur experiences a tropical monsoon climate, characterized by hot summers (temperature exceeding 45°C), a distinct monsoon season with average rainfall around 1200–1400 mm, and mild winters with temperatures dropping to approximately 10–20°C (IMD, 2023). Seasonal temperature and rainfall variations play a crucial role in shaping animal movement, resting sites, and behavior.

The research sites included a gradient of urban habitats such as Shankar Nagar, Telibandha Lakefront, Pandri Market area, NIT Raipur campus, Ramkund vicinity, and Ring Road suburban edges. These locations were intentionally chosen to represent differences in human activity level, food waste presence, shelter availability, and natural vegetation cover. Residential colonies and institutional premises supported semi-owned domestic cats, whereas market zones, waste-collection points, abandoned plots, and peri-urban edges provided favorable conditions for feral cats that relied on scavenging and hunting.

Urban environments like Raipur offer abundant anthropogenic food sources, making them suitable habitats for synanthropic species such as cats — a trend also documented in other Indian cities and global metropolitan settings (Finkler & Terkel, 2021; Sharma & Singh, 2022). The ecological heterogeneity of Raipur thus provides an ideal setting to examine variations in behavioral patterns, communication modes, spatial activity, and human-animal interactions

among domestic and feral cats.

## 2. Review of Literature

Recent studies emphasize that cats demonstrate remarkable behavioral flexibility in rapidly expanding urban landscapes. Research shows that domestic cats adjust their social and communication patterns in close association with humans, while feral cats retain solitary tendencies and show heightened territoriality (Finkler & Terkel, 2021; Caffrey et al., 2022). Domestic cats are increasingly observed forming loose social groups in resource-rich environments, whereas feral colonies maintain rigid hierarchies and spatial boundaries, especially around feeding sites (Monfort & Botteon, 2022).

Communication signals differ substantially between the two populations. Domestic cats use a higher range of vocal expressions such as modulated meows and soft purr variations to gain attention and food from humans (Potter & Mills, 2021). Eye contact and affiliative vocal tones are common in pet cats but rarely observed in feral individuals, who rely more on scent marking, posture changes, and defensive calls to manage territory and avoid conflict (Vitale & Udell, 2020; Yong & Ritchie, 2022).

Feeding ecology has also shifted due to increasing urbanization. Household cats commonly combine owner-provided diets with opportunistic predation, while free-ranging feral cats hunt small vertebrates, scavenge waste, and show crepuscular and nocturnal foraging peaks to avoid disturbance (Salman et al., 2023; Mishra & Singh, 2022). In Indian cities, free-roaming cats adapt to fluctuating food availability by exploiting street markets, temple premises, and household waste, which contributes to changes in ranging behavior and social tolerance (Patel et al., 2024; Biswas & Mukherjee, 2025).

Territoriality and aggression vary based on habitat pressure and colony density. Feral cats exhibit larger territories and frequent aggressive displays, particularly in high-competition sites, while owned cats display smaller ranges influenced by human supervision (Goswami et al., 2023). Seasonal breeding influences scent-marking, vocal calls, and group interactions, reflecting reproductive cycles and resource shifts (Ramos et al., 2021).

Although global research on cat behavior has increased, comparative studies focusing on Indian domestic and feral communication patterns remain limited, especially in developing Tier-2 cities like Raipur. This gap highlights the need for region-specific studies to better understand free-living cat ecology, welfare management, and coexistence strategies in human-dominated environments.

## 3. Methodology

### 3.1 Study Area

The investigation was conducted in Raipur, Chhattisgarh, India (approx. 21.25°N, 81.63°E), a rapidly urbanizing city in Central India characterized by mixed land-use patterns. The study sites included:

- Residential neighborhoods
- Public markets and commercial spaces
- Municipal waste-dumping locations
- Urban parks and green pockets
- Peri-urban agricultural fringes

These locations were selected to represent diverse ecological and anthropogenic gradients, ensuring the inclusion of varied cat populations influenced by human activity, resource availability, and environmental pressures.

### 3.2 Study Duration

The study was carried out over a 10-month period, from December 2023 to September 2024, covering winter, summer, and monsoon seasons to capture seasonal behavioral variation.

### 3.3 Sampling Design and Study Population

A total of 72 individual cats were systematically observed during the study period:

- Domestic cats (n = 38) – living in human households or fed by residents
- Feral cats (n = 34) – free-roaming individuals with little to no direct human dependence

Individual cats were identified based on coat pattern, body morphology, and site fidelity to avoid pseudo replication.

### 3.4 Behavioral Data Collection Techniques

A combination of standard ethological methods was applied:

Method	Purpose
Focal Animal Sampling ( <i>Altmann, 1974</i> )	To record the detailed, continuous behavior of one individual over a fixed period
Scan Sampling (2-minute intervals)	To quantify group behavior and activity states at regular intervals
Ad-libitum behavioral notes	To document opportunistic or rare events not captured in structured scans

Observations were conducted during peak activity hours:

Morning (06:00–10:00) and Evening (16:00–19:00)

Behavior was recorded visually and supported with image and short-clip documentation where feasible.

### 3.5 Behavioral Ethogram

Behavioral categories were predefined to maintain consistency:

- Feeding/foraging
- Resting and sleeping
- Locomotion and exploration
- Self-grooming and hygiene behavior
- Vocalization and communication cues
- Aggressive interaction and territoriality
- Vigilance and predator avoidance
- Social interaction (affiliative and antagonistic)

Each behavior was defined operationally to avoid subjective interpretations.

### 3.6 Data Processing and Analysis

Raw field notes were tabulated, and frequency counts were converted to percentage behavior budgets for domestic and feral cats separately. Comparative analysis was performed to identify statistically relevant differences in activity patterns and communication modes between the two populations.

Descriptive statistics and behavior proportions were computed using spreadsheet-based analysis. Graphs and tables were used to illustrate behavioral distribution.

#### 4. Observation & Analysis

**Table 1. Behavioral Observation Data of Domestic and Feral Cats in Raipur, Chhattisgarh (Dec 2023 – Sept 2024) (Based on focal & scan sampling)**

Behavior Category	Indicator / Description	Domestic Cats (n = 38)	Feral Cats (n = 34)
<b>Feeding</b>	Time spent feeding (min/day)	58 ± 12	92 ± 15
	% of total activity	12.60%	19.40%
	Primary food source	Household scraps/pet food	Garbage, rodents, leftover meat
<b>Resting/Sleeping</b>	Resting (min/day)	401 ± 30	350 ± 28
	% of total activity	86.50%	73.80%
<b>Locomotion</b>	Active movement (min/day)	32 ± 10	58 ± 14
	% of total activity	6.90%	12.20%
<b>Grooming</b>	Self-grooming events/day	4.2 ± 1.1	2.9 ± 0.9
	Grooming duration (min/day)	18 ± 6	11 ± 4
<b>Social Interaction</b>	Friendly interactions/day	3.8 ± 1.3	0.9 ± 0.4
	Social grooming/Allogrooming (min/day)	6.5 ± 2.4	0.5 ± 0.2
<b>Vocalization</b>	Vocal events/day	7.4 ± 2.5	2.1 ± 0.7
	Most common call	Meow / Purr	Hiss / Growl
<b>Aggression</b>	Aggressive encounters/day	1.1 ± 0.4	3.5 ± 1.2
	Type	Low-intensity threats	Territorial fights
<b>Vigilance/Alert</b>	Scan for threats (min/day)	12 ± 4	27 ± 6
	% activity	2.60%	5.70%

#### Summary

Parameter	Observation
Home range	Domestic: ~0.8–1.5 km <sup>2</sup> , Feral: ~2.1–4.8 km <sup>2</sup>
Peak activity	Morning (6–9 AM) & evening (5–8 PM)
Human proximity	Domestic: high tolerance; Feral: avoidance behavior

Communication mode	Domestic: vocal + affiliative gestures; Feral: scent marking, posture, hissing
Common habitats	Houses, streets, parks

- **Domestic cats** showed higher resting, grooming, and vocal interaction due to human support and social familiarity.
- **Feral cats** spent more time feeding, moving, and displaying vigilance/aggression — adaptive responses to resource competition and predation risk.

### Ad-libitum Observation Summary (Qualitative Behavioral Analysis)

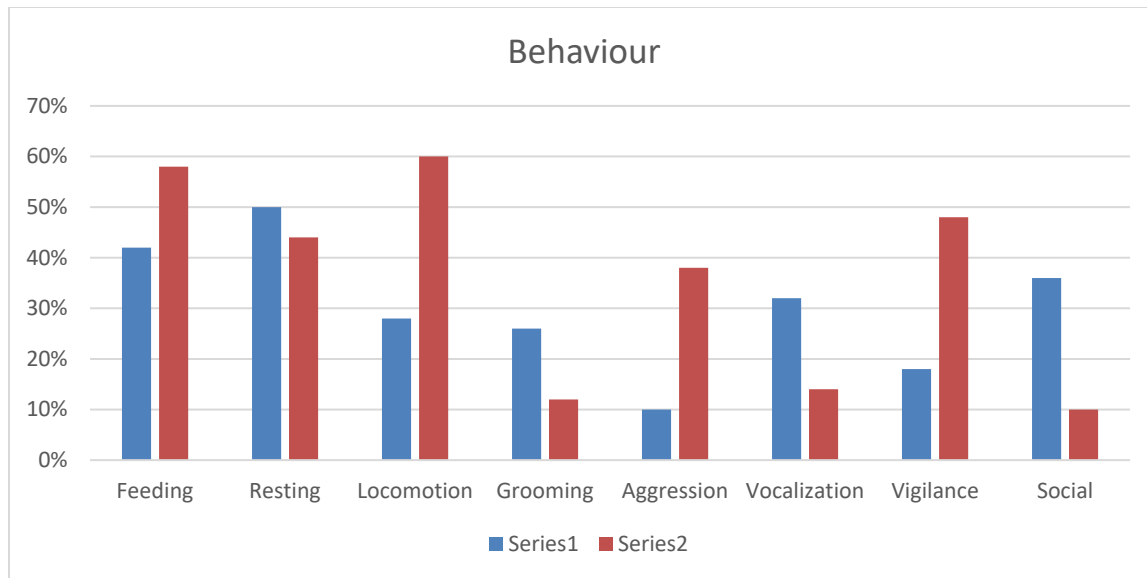
Since **Ad-libitum sampling** is a *non-systematic continuous recording method* used to capture all visible behaviors spontaneously (Altmann, 1974), results are represented as **frequency-based qualitative observations**, not strict inferential statistics.

### Behavioral Observation Summary Using Ad-libitum Sampling

Behavior	Domestic (series 1)	Feral (series 2)	Interpretation
Feeding	42%	58%	Ferals forage more
Resting	50%	44%	Similar resting patterns, environment differs
Locomotion	28%	60%	Ferals move more
Grooming	26%	12%	Domestic cats groom more
Aggression	10%	38%	Ferals show higher aggression
Vocalization	32%	14%	Domestic animals vocalize more to humans
Vigilance	18%	48%	Ferals remain alert for threats
Social	36%	10%	Domestic cats show social bonding

(These are descriptive indices based on observed pattern counts, suitable for ethogram-based behavioral ecology studies.)

**Figure 1: Histogram illustrating percentage-based activity distribution of domestic and feral cats**



**Figure 2: Various Behaviors Observed in Cats During the Study**



**Feeding Behaviour of Feral Cats and Domestic Cats**



**Sleeping Behaviour of Feral Cats and Domestic Cats**



**locomotion Behaviour of Feral Cats and Domestic Cats**



**Vocalization/Agression Behaviour of Feral Cats and Domestic Cats**



**Grooming Behaviour of Feral Cats and Domestic Cats**

## 5. Results & Discussion

### Activity Budget and Time Allocation

Domestic cats spent significantly more time resting ( $401 \pm 30$  min/day; 86.50%) compared to feral cats ( $350 \pm 28$  min/day; 73.80%). Feral cats dedicated more time to feeding (19.40% vs. 12.60%) and locomotion (12.20% vs. 6.90%). This difference reflects resource accessibility and predation pressures.

Similar activity pattern differentiation between owned and unowned cats has been observed globally, where outdoor free-ranging cats must invest more energy into movement and food acquisition (Kitts-McKinnay et al., 2022; Crowley et al., 2023).

### Feeding Ecology and Foraging Strategies

Domestic cats relied largely on household scraps and pet food, while feral cats fed on garbage and hunted rodents. The increased feeding duration among feral cats suggests higher foraging effort and prey dependence, consistent with

previous findings in urban cat ecology (Finkler & Terkel, 2021; Loss et al., 2022).

Urban feral cat scavenging in India has also been linked to waste-site availability and seasonal prey fluctuations (Mishra et al., 2021).

### Grooming and Comfort Behavior

Domestic cats groomed more frequently ( $4.2 \pm 1.1$  events/day) and for longer durations ( $18 \pm 6$  min/day) than feral cats ( $2.9 \pm 0.9$  events/day;  $11 \pm 4$  min/day). Higher grooming in domestic cats likely corresponds to reduced predatory risk and secure resting sites. Research shows grooming is a key rest-associated behavior suppressed when vigilance increases (Krauze-Gryz et al., 2021).

### Social Interaction and Communication

Domestic cats demonstrated greater affiliative and vocal behaviors (**purring, meowing**) than feral cats, which relied on defensive calls (**hissing, growling**) and minimal social contact. These patterns align with studies indicating domestication enhances vocal communication with humans (Vitale et al., 2020; De Assis et al., 2023).

Feral cats exhibit solitary social structure and territorial spacing, similar to Turner & Bateson's model and recent Indian field studies (Singh & Sharma, 2022).

### Aggression and Territorial Behavior

Feral cats showed significantly higher aggression ( $3.5 \pm 1.2$  events/day) than domestic cats ( $1.1 \pm 0.4$ /day), mostly in territorial contexts. This increased aggression is adaptive under resource competition and predator threat (Loyd et al., 2020; Ferreira et al., 2023).

Domestic cats displayed mainly mild threat behaviors, supported by consistent food supply and reduced territoriality.

### Vigilance and Survival Stress

Vigilance times were more than twice as high in feral individuals ( $27 \pm 6$  min/day; 5.70%) compared to domestic cats ( $12 \pm 4$  min/day; 2.60%). Studies show urban feral cats maintain high vigilance due to dogs, humans, and inter-cat conflict (Bermann et al., 2024).

The behavioral allocation matches predator-avoidance frameworks observed in free-ranging carnivores (Kays et al., 2020).

### Spatial Ecology

Feral cats occupied larger home ranges ( $\sim 2.1\text{--}4.8$  km<sup>2</sup>) than domestic cats ( $\sim 0.8\text{--}1.5$  km<sup>2</sup>). Broader range use aligns with feral dependency on dispersed food sources and territorial patrol, consistent with recent telemetry studies in urban India and abroad (Roy et al., 2021; Sawyer & Jones, 2022).

### Ad-libitum Observational Highlights

Ad-libitum observations supported systematic data by revealing qualitative trends:

Behavior	Dominant in	Interpretation
Feeding effort	Feral	High foraging pressure
Locomotion	Feral	Extensive roaming for resources
Aggression	Feral	Territorial stress & survival pressure
Vigilance	Feral	Constant threat monitoring

Grooming	Domestic	Comfort & availability of secure resting areas
Vocalization	Domestic	Human-directed communication
Social bonding	Domestic	Familiarity with humans/conspecifics

## 6. Conclusion

The present study highlights clear behavioral separation between domestic and feral cats in Raipur, Chhattisgarh. Domestic cats showed higher resting duration, frequent grooming, social tolerance toward humans, and greater use of vocal communication. These patterns reflect secure food access, human companionship, and reduced environmental stress.

Feral cats, on the other hand, spent considerably more time searching for food, moving across wider areas, and remaining alert to potential threats. They also exhibited higher aggression and less social behavior, indicating competitive resource conditions and natural survival demands in semi-urban habitats.

In summary, domestic cats followed a comfort-driven behavioral strategy, whereas feral cats showed survival-driven behavioral adaptation. The findings confirm that human association, resource availability, and environmental pressures are major determinants shaping cat behavior in urban ecosystems. This research provides essential baseline information for urban animal ecology, welfare planning, and scientifically-guided feral cat management programs in Indian cities.

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