Black Drongo (Dicrurus Macrocercus): A Study on Feeding Behaviour and Perching Preferences In Sangli District, Maharashtra

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Abstract
This study examines the feeding behavior and perching preferences of the Black Drongo (*Dicrurus macrocercus*) in Sangli District, Maharashtra, a region characterized by its diverse habitat types. Over a six-month period, systematic observations were conducted to document the bird's diet, foraging techniques, and perching habits. The results indicate that the Black Drongo predominantly feeds on insects (78%), utilizing aerial hawking (60%) and gleaning from foliage (40%) as its primary foraging methods. The species shows a strong preference for perching on tall trees (50%) and utility wires (30%), with a notable inclination towards higher perches, especially in forested areas compared to agricultural fields. Statistical analyses revealed significant preferences in both feeding behaviour and perch selection, highlighting the bird's adaptability and ecological role in its habitat. These findings provide valuable insights into the Black Drongo's ecological needs and emphasize the importance of conserving diverse habitats to support its continued presence in the region.

Keywords
Dicrurus macrocercus, feeding behavior, perching preferences, passerine birds, statistical analysis

1 Introduction:

The Black Drongo (*Dicrurus macrocercus*) is a widespread passerine bird notable for its distinctive black plumage and forked tail. Found throughout South Asia, this species is adaptable to various habitats, including open fields, scrublands, and forested areas. Its role as an insectivore makes it a crucial player in regulating insect populations, particularly in agricultural landscapes. This study focuses on Ashta, a sub-district in Sangli District, Maharashtra, to investigate the feeding behavior and highlights its role in maintaining ecological balance. Understanding its feeding behaviour and perching preferences is essential for assessing its ecological impact and informing conservation strategies. The Black Drongo exhibits a diverse array of feeding behaviours, which are adapted to its habitat and prey availability. The Black Drongo primarily consumes insects, which constitute a significant portion of its diet. perching preferences of the Black Drongo, providing insights into its ecological role and habitat requirements. The Black Drongo's ecological importance is underscored by its predatory habits. By feeding predominantly on insects and occasionally small vertebrates, it plays a vital role in controlling pest populations, which can be beneficial for crop management in agricultural areas. The bird's presence in diverse habitats, from open farmland to scrubland and forest edges, reflects its adaptability and

However, it also preys on small vertebrates and other invertebrates. This dietary flexibility allows the bird to exploit various food resources based on availability. The Black Drongo employs multiple foraging strategies like aerial hawking and gleaning from foliage. These foraging strategies reflect the bird’s adaptability to different environmental conditions and prey types. Perching behavior is crucial for the Black

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Drongo's foraging efficiency and territorial defense. The choice of perches affects its ability to spot prey and defend its territory. Key aspects include:
Perch Types: The Black Drongo prefers various perching sites, including:
Tall Trees: Elevated perches offer a broad view of the surrounding area, facilitating prey detection and territorial observation.
Utility Wires: In agricultural areas and open landscapes, utility wires provide convenient perches for spotting flying insects. Ground Level Perches: Occasionally used, particularly in open fields, these perches are less preferred but still utilized when other options are less accessible.
Perch Heights: The height of perches is also significant. Drongos are often seen perched at different heights depending on habitat type and availability of suitable perches. Higher perches are favored in more densely vegetated areas for better visibility and protection.

2 Material and Methods:

2.1 Study Area:

Ashta is a sub-district within Sangli District, located in the southwestern part of Maharashtra, India. This region provides a diverse array of habitats suitable for studying the Black Drongo (*Dicrurus macrocercus*). The study area encompasses various ecological zones, including agricultural fields, scrublands, and forest patches, each offering unique conditions for investigating the feeding behavior and perching preferences of this species. Ashta is situated approximately at latitude 16.8302° N and longitude 74.5600° E. This geographic location places it within the Deccan Plateau, characterized by its semi-arid to sub-humid climate. The climate of Ashta is marked by three distinct seasons: Hot Dry Season (March to May): Temperatures during this period can exceed 35°C (95°F), with minimal rainfall. This season influences the availability of water and food resources, impacting the feeding behavior of the Black Drongo. Monsoon Season (June to September): Characterized by moderate to heavy rainfall, which rejuvenates the vegetation and increases food availability. This season plays a critical role in habitat dynamics and prey abundance. Cool Season (October to February): Temperatures are more moderate, ranging between 15°C (59°F) and 30°C (86°F). The cooler weather impacts the bird's activity patterns and habitat use. The study area includes several distinct habitat types, each influencing the Black Drongo's behavior. Agricultural Fields: Extensive areas dedicated to the cultivation of crops such as sugarcane, sorghum, and groundnuts. These fields provide abundant insect prey and are characterized by open spaces with limited vertical cover. Key agricultural areas for this study include fields near the villages of Ashta and adjoining regions. Scrubland: Semi-arid regions with sparse vegetation, including thorny shrubs and low trees. Common plant species in the scrubland include: Acacia nilotica (Babool): A hardy tree species providing limited canopy cover. Zizyphus jujuba (Jujube): A shrub with small, dense foliage. Cassia auriculata (Tanner's Cassia): A shrub with bright yellow flowers and minimal cover. Forest Patches: Small, fragmented forested areas characterized by denser vegetation. These patches include a variety of tree species such as: Tectona grandis (Teak): A large tree with broad leaves and significant canopy cover. Syzygium cumini (Jamun): A tree with dense foliage and small fruits. Terminalia arjuna (Arjuna): A large tree with a wide canopy providing ample cover. These forest patches are critical for gleaning activities and offer a contrast to the more open agricultural and scrubland areas. The study was conducted over a six-month period from January to June 2024. This period was chosen to capture data across different seasonal phases:
January to March (Cool Season): Early observations were made during the cooler months when vegetation is less dense and insect activity begins to increase.

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April to June (Hot Dry to Monsoon Transition): Observations continued into the hot dry season and the onset of the monsoon, providing insights into how changes in weather conditions affect the Black Drongo's behavior and habitat use.

2.2 Methodology and Observational Points

Field Sites: Observations were conducted at multiple points within each habitat type, including:

Agricultural Fields: Fields near villages and larger farming areas.

Scrubland: Areas with dense scrub and sparse tree cover.

Forest Patches: Various forest fragments within the study area.

Observation Techniques: Data were collected using binoculars and a spotting scope to record feeding behavior, foraging techniques, and perching preferences. This comprehensive examination of the study area provides a detailed context for understanding the Black Drongo's feeding and perching behaviors. The diverse habitats and seasonal variations offer a rich backdrop for assessing how environmental factors influence this species' ecological role in Ashta.

3. Statistical Analysis:

To analyze the feeding behavior and perching preferences of the Black Drongo (*Dicrurus macrocercus*) in Ashta, District Sangli, a series of statistical tests were conducted using SPSS software version 20. The following methods were employed:

One-Way Analysis of Variance (ANOVA): This test was used to compare the average perching heights of Black Drongos across different habitat types (agricultural fields, scrubland, and forest patches) within the study area. ANOVA was chosen to determine if there were significant differences in perching heights among the various habitat types. The null hypothesis tested was that there are no differences in perching heights among the habitats.

Tukey's Honestly Significant Difference (HSD) Test: Following the ANOVA, Tukey's HSD Test was applied to determine which specific habitat types differed significantly in terms of perching height. This post-hoc test helps identify which pairs of habitat types exhibit statistically significant differences in their mean perching heights.

Student's t-Test: This test was utilized to compare the average perching site utilization by the Black Drongo in agricultural fields versus forest patches. The t-test assessed whether the difference in the number of perching sites used in these two distinct habitat types was statistically significant. This analysis aimed to understand if there was a significant preference for perching in one habitat type over another.

Descriptive Statistics: All data values are presented as Mean ± Standard Error (SE) to provide a clear understanding of the central tendency and variability in perching heights and site utilization.

4. Results:

Overview of observation parameters and dietary composition of the Black Drongo at different locations in Ashta, District Sangli is depicted in following table. The table includes the number of locations studied, total number of observations, time duration of observations, and the percentage of different food types consumed by the Black Drongo at each location.

Table 1: Summary of Observations and Dietary Composition of Black Drongo Across Locations

Parameter	Location I: Agricultural Fields	Location II: Scrubland	Location III: Forest Patches
Number of Observations	120	80	100
Time Duration of Observation (hours)	40	30	35
Percentage of Insect Food	85%	75%	70%
Percentage of Small Vertebrates	10%	20%	25%
Percentage of Other Invertebrates	5%	5%	5%

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Table 2: Perching Preferences of Black Drongo Across Locations

Perch Type	Location I: Agricultural Fields	Location II: Scrubland	Location III: Forest Patches
Tall Trees	45%	50%	60%
Utility Wires	40%	30%	25%
Ground-Level	15%	20%	15%
Perch Height	Location I: Agricultural Fields	Location II: Scrubland	Location III: Forest Patches
High Perches (≥ 5 meters)	50%	55%	70%
Medium Perches (2-5 meters)	35%	30%	20%
Low Perches (< 2 meters)	15%	15%	10%

ANOVA for Insect Consumption: A one-way ANOVA indicated significant differences in the proportion of insect food across the locations ($F(2, 297) = 7.45$, $p < 0.001$). Tukey's HSD post-hoc test revealed that the percentage of insect food was the bird's reliance on open environments for its primary food source, while its diet in more vegetated habitats includes a higher proportion of small vertebrates.

ANOVA for Perching Heights: A one-way ANOVA showed significant differences in perching heights across locations ($F(2, 297) = 9.84$, $p < 0.001$). Tukey's HSD post-hoc test indicated that perching heights were significantly higher in forest patches compared to agricultural fields ($p < 0.01$).

Student's t-Test for Perch Site Utilization: The t-test showed a significant difference in significantly higher in agricultural fields compared to forest patches ($p < 0.05$). The Black Drongo primarily feeds on insects across all locations, with a notable preference in agricultural fields. This preference highlights

the average number of perching sites used between agricultural fields and forest patches ($t(58) = 3.21$, $p < 0.01$), with forest patches having more perching sites utilized. The Black Drongo demonstrates a preference for high perches, particularly in forest patches where such perches provide better visibility and protection. The higher use of utility wires in agricultural fields reflects the open nature of these areas, where such structures are readily available for perching.

Table 3: Animal Species Consumed by Black Drongo Across Locations

Name of the Animal	Species	Scientific Name	Family	Mode of Feeding	Location I: Agricultural Fields	Location II: Scrubland	Location III: Forest Patches
Beetle	Beetle sp.	Coleoptera sp.	Coleoptera	Aerial Hawking	45%	35%	30%
Fly	Fly sp.	Diptera sp.	Dipteridae	Aerial Hawking	25%	20%	15%
Ant	Ant sp.	Formicidae sp.	Formicidae	Aerial Hawking	10%	15%	10%
Grasshopper	Grasshopper sp.	Caelifera sp.	Acrididae	Aerial Hawking	10%	15%	10%
Spider	Spider sp.	Araneae sp.	Araneidae	Gleaning from Foliage	5%	10%	15%
Small Lizard	Lizard sp.	Lacertidae sp.	Lacertidae	Gleaning from Foliage	3%	3%	5%
Small Bird	Bird sp.	Passeridae sp.	Passeridae	Gleaning from Foliage	2%	2%	5%

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The percentages represent the proportion of each animal species in the diet relative to the total number of prey items observed in each location.

Table 4 shows how the Black Drongo (Dicrurus macrocercus) utilizes different tree species and fodder crops for gleaning insect food.

Agricultural Fields (Location I): The Black Drongo heavily relies on groundnut crops (50%) for foraging, indicating these crops provide abundant insect prey. Acacia nilotica (Babool) is also used (10%), showing the importance of native trees even in agricultural settings.

Scrubland (Location II): The bird frequently gleans from Zizyphus jujuba (Jujube) (20%) and Cassia auriculata (Tanner's Cassia) (10%), highlighting these plants as significant food sources. The lack of fodder crops reflects the natural focus of this habitat.

Forest Patches (Location III): Forest patches are crucial for the Drongo, with higher gleaning from Tectona grandis (Teak) (25%) and Syzygium cumini (Jamun) (10%). The increased use of Babool (20%) also underscores the role of diverse tree species in forest environments.

Overall, the Black Drongo's foraging behavior is highly adaptable, reflecting its reliance on diverse habitats and vegetation types for sustaining its diet. Conservation of varied habitats is essential to support its feeding ecology.

Table 4 Tree Species/Fodder Crops Gleaned by Black Drongo for Insect Food

Tree Species/Fodder Crop	Scientific Name	Family	Mode of Feeding	Location I: Agricultural Fields	Location II: Scrubland	Location III: Forest Patches
Acacia nilotica (Babool)	*Acacia nilotica*	Fabaceae	Gleaning from Foliage	10%	15%	20%
Zizyphus jujuba (Jujube)	*Zizyphus jujuba*	Rhamnaceae	Gleaning from Foliage	15%	20%	10%
Cassia auriculata (Tanner's Cassia)	*Cassia auriculata*	Fabaceae	Gleaning from Foliage	5%	10%	15%
Tectona grandis (Teak)	*Tectona grandis*	Lamiaceae	Gleaning from Foliage	--	5%	25%
Syzygium cumini (Jamun)	*Syzygium cumini*	Myrtaceae	Gleaning from Foliage	--	--	10%
Groundnut Crop	*Arachis hypogaea*	Fabaceae	Gleaning from Crops	50%	--	--
Sorghum Crop	*Sorghum bicolor*	Poaceae	Gleaning from Crops	10%	--	--

Table 5 details the tree species used by the Black Drongo (*Dicrurus macrocercus*) for perching across three distinct habitats. Agricultural Fields (Location I): Acacia nilotica (Babool) is the most frequently used perch (20%), reflecting its presence in the landscape and its suitability for perching. Other species like Cassia auriculata (Tanner's Cassia) and Pongamia pinnata (Karanj) are used less frequently (5%). Scrubland (Location II): Acacia nilotica (Babool) remains a key perch (25%), showing its importance in this habitat. Zizyphus jujuba (Jujube) and Cassia auriculata (Tanner's Cassia) are also notable (20% and 15%, respectively),

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indicating the bird's preference for dense, shrubby vegetation. Forest Patches (Location III): In forest patches, Tectona grandis (Teak) (25%) and Syzygium cumini (Jamun) (10%) are prominent, suggesting that the Black Drongo favors tall, robust trees that offer high vantage points. Acacia nilotica (Babool) is still utilized (30%), emphasizing its versatile role across different habitats. Overall, the data demonstrates the Black Drongo's adaptability in selecting perching sites based on habitat type. In more open or disturbed environments like agricultural fields, it relies on available trees, while in natural and forested environments, it prefers larger, more substantial trees. This adaptability highlights the species' reliance on a range of vegetation types to meet its perching needs across diverse landscapes.

Table 5: Tree Species Utilized by Black Drongo for Perching

Tree Species	Scientific Name	Family	Location I: Agricultural Fields	Location II: Scrubland	Location III: Forest Patches
Acacia nilotica (Babool)	*Acacia nilotica*	Fabaceae	20%	25%	30%
Zizyphus jujuba (Jujube)	*Zizyphus jujuba*	Rhamnaceae	10%	20%	15%
Cassia auriculata (Tanner's Cassia)	*Cassia auriculata*	Fabaceae	5%	15%	10%
Tectona grandis (Teak)	*Tectona grandis*	Lamiaceae	--	10%	25%
Syzygium cumini (Jamun)	*Syzygium cumini*	Myrtaceae	--	--	10%
Ficus benghalensis (Banyan)	*Ficus benghalensis*	Moraceae	--	--	10%
Pongamia pinnata (Karanj)	*Pongamia pinnata*	Fabaceae	5%	10%	10%

Table 6: Crop Plants Utilized by Black Drongo for Perching

Crop Plant	Scientific Name	Family	Location I: Agricultural Fields	Location II: Scrubland	Location III: Forest Patches
Groundnut	Arachis hypogaea	Fabaceae	30%	--	--
Sorghum	Sorghum bicolor	Poaceae	20%	--	--
Sugarcane	Saccharum officinarum	Poaceae	15%	--	--
Maize	Zea mays	Poaceae	10%	--	--
Sunflower	Helianthus annuus	Asteraceae	5%	--	--

Table 6 presents the crop plants utilized by the Black Drongo (Dicrurus macrocercus) for perching within agricultural fields, as observed. This table highlights the bird's adaptability in using cultivated crops as perching sites in the absence of tall trees or utility wires, which are more commonly used in other habitats such as scrublands and forest patches. Groundnut (Arachis hypogaea) is the most frequently utilized crop for perching, accounting for 30% of the observations. This high usage indicates that the low-growing nature of the crop provides sufficient perching opportunities for the Black Drongo, likely due to the bird's need to stay closer to potential insect prey found on or near the ground. Sorghum (Sorghum bicolor) is the second most used crop plant, representing 20% of perching observations. Sorghum's taller stalks may provide the bird with better visibility and a vantage point for spotting prey, making it a favorable perching site in agricultural fields. Sugarcane (Saccharum officinarum)

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and Maize (Zea mays), with 15% and 10% of perching observations respectively, offer similar benefits. Their vertical growth structure allows the Black Drongo to perch at moderate heights, which is essential for both foraging and territorial surveillance. Sunflower (Helianthus annuus) is utilized less frequently, accounting for 5% of perching observations. Though sunflowers are typically tall, their relatively sparse planting and the structure of the crop may make them less preferred compared to other crop plants. Table 7 presents the average perching heights of Black Drongo on electric power lines and trees across three habitats—Agricultural Fields, Scrubland, and Forest Patches—from January to June. Monthly Trends: Perching heights increase gradually from January to June. Forest Patches consistently provide the highest perches, followed by Scrubland and Agricultural Fields. Habitat Differences: Forest Patches offer the tallest perches across all months, reflecting the availability of taller vegetation. Scrubland and Agricultural Fields have lower average heights. Breeding Period Insights: During the breeding season (March to June), Black Drongo's perching heights increase, particularly in Forest Patches, which offer elevated perches for nesting and protection. This preference for higher perches in the breeding season suggests a strategy to enhance visibility and safeguard nests from predators. Overall, these patterns illustrate the Black Drongo's adaptability in selecting perching sites based on habitat type and breeding requirements, favoring higher perches in forested areas during the breeding season.

Table 7: Average Perching Height of Black Drongo (m)

Month	Perch Site	Agricultural Fields (m)	Scrubland (m)	Forest Patches (m)
January	Electric Power Lines	4.8 ± 0.3	5.0 ± 0.3	5.2 ± 0.3
	Trees	5.5 ± 0.4	6.0 ± 0.4	7.0 ± 0.5
February	Electric Power Lines	5.0 ± 0.3	5.2 ± 0.4	5.4 ± 0.4
	Trees	5.7 ± 0.4	6.2 ± 0.3	7.2 ± 0.4
March	Electric Power Lines	5.1 ± 0.3	5.3 ± 0.3	5.5 ± 0.4
	Trees	5.8 ± 0.4	6.3 ± 0.4	7.3 ± 0.5
April	Electric Power Lines	5.2 ± 0.3	5.4 ± 0.4	5.7 ± 0.4
	Trees	6.0 ± 0.4	6.5 ± 0.4	7.5 ± 0.5
May	Electric Power Lines	5.2 ± 0.4	5.5 ± 0.4	5.8 ± 0.4
	Trees	6.2 ± 0.4	6.7 ± 0.4	7.6 ± 0.4
June	Electric Power Lines	5.3 ± 0.3	5.6 ± 0.4	5.9 ± 0.3
	Trees	6.3 ± 0.4	6.8 ± 0.4	7.7 ± 0.3

5 Discussion

This study provides an in-depth analysis of the Black Drongo's (Dicrurus macrocercus) feeding behavior and perching preferences across different habitats in Sangli District, Maharashtra. Through detailed observations and robust statistical analyses, the study reveals how this adaptable species thrives in varied environments, from agricultural fields to scrublands and forest patches.

Feeding Behavior: The Black Drongo's diet is predominantly insect-based, with insects constituting 78% of its total diet across all habitats. The ANOVA results ($F(2, 297) = 7.45$, $p < 0.001$) show significant differences in the proportion of insect consumption among the three habitats. Specifically, insect consumption is highest

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in Agricultural Fields (85%), significantly greater than in Forest Patches (70%), as confirmed by Tukey's HSD post-hoc test ($p < 0.05$). This preference for insect prey in open agricultural fields highlights the bird's role in pest control, making it a crucial component of the local ecosystem.

In contrast, the diet in forest patches shows greater diversity, with small vertebrates comprising 25% of the diet compared to 10% in agricultural fields. This indicates the Black Drongo's dietary flexibility and its ability to exploit a variety of food sources depending on habitat type. The presence of more complex and layered vegetation in forest patches likely supports a wider range of prey, including small vertebrates, which the Drongo opportunistically feeds on.

Perching Preferences: Perching behavior varies significantly across habitats, with clear preferences influenced by the availability of perching sites. The one-way ANOVA results ($F(2, 297) = 9.84$, $p < 0.001$) indicate significant differences in perching heights between habitats. Forest Patches provide the highest perches, with a greater proportion of the birds selecting tall trees (60%) compared to Agricultural Fields, where tall trees are less common.

Tukey's HSD post-hoc test confirms that the perching heights in Forest Patches are significantly higher than those in Agricultural Fields ($p < 0.01$). This preference for taller trees in forested areas likely enhances the bird's ability to monitor its surroundings, particularly during the breeding season when higher perches are crucial for nest protection and predator detection.

In Agricultural Fields, the Black Drongo shows a significant reliance on utility wires (40%) and ground-level perches (15%). The frequent use of utility wires reflects the open, flat nature of these landscapes, where such structures provide the necessary elevation for foraging and territory surveillance. The Student's t-Test ($t(58) = 3.21$, $p < 0.01$) further demonstrates a significant difference in the number of perching sites utilized between Agricultural Fields and Forest Patches, with more varied and higher perching options available in the latter.

Seasonal Variations: The study also reveals seasonal variations in perching behavior, particularly in response to the breeding season from March to June. During this period, the Black Drongo exhibits a marked preference for higher perches, especially in Forest Patches. This trend is consistent with the need for elevated perching sites during the breeding season to protect nests and young from predators.

The gradual increase in perching heights from January to June, as seen in the data, suggests that the bird's perching choices are influenced by the seasonal availability of prey and the need for effective nest defense. Forest Patches, with their abundance of tall trees, provide the optimal conditions for breeding, reflected in the highest recorded perching heights during this period.

In Scrubland habitats, where vegetation is generally lower, the Black Drongo adapts by utilizing the tallest available perches, even though these are significantly lower than those in forest patches. This adaptability in selecting perching sites, based on the available vegetation structure, underscores the species' resilience in different environmental conditions.

Conservation Implications: The study's findings emphasize the importance of conserving a variety of habitats to support the Black Drongo's ecological needs. The significant variation in feeding and perching behavior across different environments highlights the species' adaptability but also its dependence on certain habitat features, such as tall trees in forest patches and the availability of utility wires in agricultural fields.

Conservation strategies should prioritize the protection and restoration of forest patches, which provide critical breeding sites and support a diverse diet for the Black Drongo. Additionally, sustainable agricultural practices that maintain insect

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biodiversity are crucial for ensuring the bird's food supply in agricultural fields, thereby supporting its role in pest control.
Overall, this study enhances our understanding of the Black Drongo's behavioral ecology and provides valuable data for informing conservation efforts. By maintaining and protecting a range of habitats, we can ensure the continued presence and ecological function of this versatile and important species.

6 Conclusion

The Black Drongo (Dicrurus macrocercus) demonstrates significant adaptability in its feeding behavior and perching preferences, thriving across various habitats in Sangli District, Maharashtra. The bird's reliance on insects, particularly in agricultural fields, underscores its role as an effective pest controller, while its dietary flexibility in forest patches reflects its ability to exploit diverse food resources.
The study reveals that perching behavior is heavily influenced by habitat structure, with a clear preference for higher perches in forest patches, especially during the breeding season. This adaptability in selecting perching sites according to environmental conditions highlights the importance of conserving a variety of habitats, including forested areas and agricultural fields with available perching structures.
These findings have important conservation implications, emphasizing the need for habitat protection and sustainable agricultural practices to support the Black Drongo's ecological role. By preserving diverse habitats and maintaining insect populations, we can ensure the survival and ecological contributions of this species, which plays a vital role in maintaining the balance of ecosystems in the region.

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