International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 25-04-2024, Accepted: 17-05-2024, Published: 10-06-2024
Volume 9, Issue 6, 2024, Page No. 24-31

# A study of the species diversity and abundance of avian fauna (Phylum Chordata, Class Aves) in Birati town, north 24 parganas district, West Bengal

**Saurav Shome**
Department of Zoology, Bhairab Ganguly College, Belgharia, Kolkata, West Bengal, India

**Abstract**
The present study emphasizes the diversity and abundance of bird species in Birati town, situated in the North 24 Parganas district of West Bengal. This study is the first comprehensive and thorough investigation of the existing variety and distribution of avian fauna in Birati town, where, until now, no published report has been available. The one-year study, conducted from January 2023 to December 2023, recorded 70 bird species from 30 families and 12 orders in the town. In Birati, the greatest species diversity was found within the order Passeriformes, while the families Ardeidae, Cuculidae, and Picidae had the highest number of bird species recorded during the study. The results of the present study indicate that, despite being a densely populated urban area, Birati town houses a rich avian fauna that requires active monitoring and protection.

**Keywords:** Species, diversity, abundance, birds, Birati, West Bengal

## Introduction

Birds, a diverse group of endothermic, feathered vertebrates, constitute the class Aves within the phylum Chordata [1-3]. These captivating creatures inspire fascination owing to their beauty, activities, and colorful plumage. Characterized by beaks, feathers, and a four-chambered heart, birds exhibit adaptations for flight, though species like the ostrich, emu, and kiwi are flightless [1-3].

Birds are found worldwide, inhabiting various ecosystems and playing multifaceted and indispensable roles in the overall health and functioning of these environments [4, 5]. As integral components of ecosystems, they contribute significantly to various ecological phenomena such as pollination, seed dispersal, insect control, and nutrient cycling, thereby maintaining balance in natural ecosystems [4-9].

Many bird species are important pollinators for numerous plants. As they feed on nectar, pollen gets transferred between flowers, facilitating the reproduction of many plant species [4-6]. Additionally, birds are instrumental in seed dispersal; they consume fruits and then transport seeds to different locations, dispersing them through their droppings and aiding plants in colonizing new areas [4-6, 8].

Many bird species are natural predators of insects, small rodents, and certain plant-eating invertebrates, acting as natural pest controllers. Birds prey on these pest populations, helping regulate these populations and preventing unchecked growth that could otherwise harm ecosystems or agricultural areas [4-9].

Birds contribute to nutrient cycling by scavenging on carrion. The consumption of dead animals by various bird species helps break down organic matter, returning essential nutrients to the soil. This process aids in decomposition and enriches the soil, supporting plant growth in ecosystems [4-6]. Furthermore, bird droppings contain valuable nutrients that enrich the soil, promoting plant growth and influencing nutrient dynamics in various habitats [4-9].

Birds occupy various niches within ecosystems, showcasing a diverse range of feeding habits, behaviors, and ecological interactions that contribute to overall ecosystem health [4-7]. Moreover, birds are integral to food webs as both predators and prey. They serve as a food source for numerous predators, such as raptors, snakes, mammals, and other animals, contributing to the energy flow within ecosystems. They also consume a variety of prey, such as insects, worms, fish, and small animals, affecting the population dynamics and interactions of these organisms [4-9].

The presence or absence of certain bird species can influence the behavior of other organisms, indicating intricate ecological relationships. Various activities of birds, such as digging for food or creating nests and cavities in trees, can provide nesting sites for other animals, influencing habitat structure and supporting biodiversity [6-9]. Many bird species are considered keystone species owing to their significant impacts on ecosystems, influencing species composition and ecosystem processes. Their extinction could dramatically alter the ecosystem and potentially lead to cascading effects on other species [4, 8-11].

Birds offer numerous ecosystem services that benefit humans and other living beings. Therefore, birds have been effectively utilized as umbrella species in conservation strategy and management because safeguarding them is expected to have a positive influence on a diverse spectrum of coexisting species [11-14].

Additionally, birds serve as valuable indicator species, reflecting ecosystem health, vegetation changes, pollution levels, and climate change impacts [4-7]. Changes in bird populations or behaviors provide early warnings of environmental issues and help assess the success of conservation efforts, offering an effective way to understand ecosystem dynamics and the overall condition of ecosystems [4-6, 15-17]. Bird diversity, abundance, and population size can indicate overall plant diversity in an area owing to the interdependence of avian fauna and plants [4-5].

Study of diversity and abundance of bird species help assess urbanization effects on microclimate, temperature, and vegetation [15-22]. Changes in land use patterns affect landscapes, impacting bird diversity, abundance, and distribution. Ecologists use birds as model organisms and monitor bird populations to study habitat loss, fragmentation, climate change, and plant-animal

interactions, and to gauge urbanization effects on microclimate and vegetation [15- 23].

India's status as a megadiverse country is underscored by its vast and varied ecosystems, rich species diversity, and significant efforts toward conservation [24]. Numerous reports on bird diversity across various regions of India highlight the country's impressive variety of bird species [25-29]. According to the recent reports, India hosts more than 1,300 bird species, including both resident and migratory species, making it one of the most bird-rich regions globally [25]. This high number of bird species reflects India's diverse habitats, ranging from the Himalayan mountains to coastal regions, and from arid deserts to lush forests [24, 25, 30, 31].

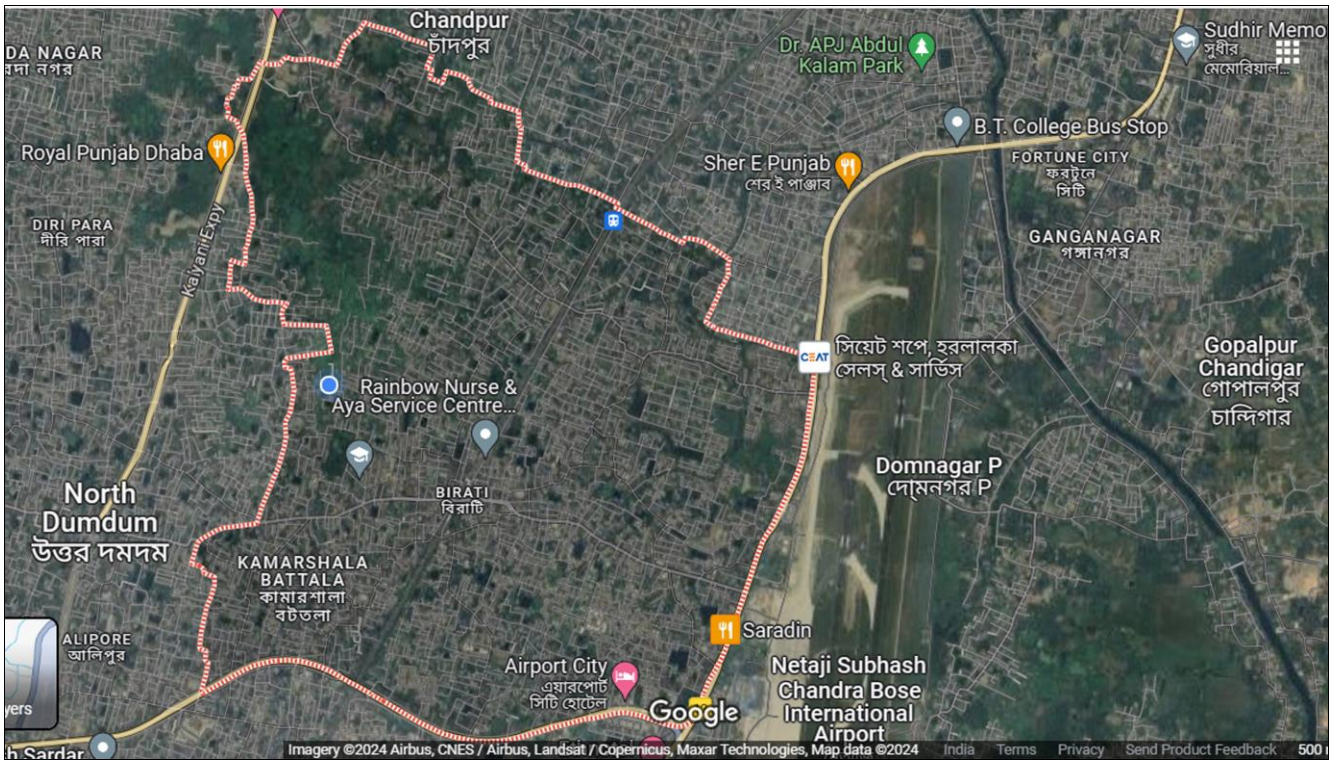
Although checklists documenting the diversity of avian fauna exist for different parts of India, no study has yet been conducted in Birati, a densely populated town in the North 24 Parganas district of West Bengal.

While the present author has conducted a study on the diversity and abundance of butterfly species in the aforementioned town, no report on the existing variety of avian species and their distribution in Birati is available to date [32]. Therefore, it was interesting to investigate the diversity and abundance of bird species in a densely populated suburban town like Birati. Given the crucial and diverse roles of birds in maintaining overall ecosystem health and functioning, and to guide conservation efforts, the present study was conducted to identify and document the species diversity and abundance of avifauna in Birati.

## Materials and methods

### Study area

Birati (22066′N, 88°42′E), a town located in the Barrackpore subdivision of North 24 Parganas district in West Bengal, is situated along the Jessore Road. This densely populated town receives municipal services from North Dumdum Municipality. The Kolkata Metropolitan Development Authority (KMDA) is the statutory body responsible for the planning and development of the town. Spanning an area of about 11 km2, Birati is surrounded by New Barrackpore to the north, Durganagar to the south, Jessore Road to the east, and Belgharia to the west (Figure 1).




(Image source: Google Maps)

**Fig 1:** A satellite image of Birati town, situated in the North 24 Parganas district of West Bengal.

During the summer months (March to May), temperatures in Birati can range from 30°C to 41°C, resulting in a hot and humid climate. On the other hand, during the winter months (October to February), temperatures are milder, typically ranging from 10°C to 20°C. The town experiences significant rainfall, particularly during the monsoon season (June to September), with annual precipitation typically ranging from 1500 to 2500 millimeters. Birati is situated at an elevation of 6 meters above Mean Sea Level (MSL).

In the present study, several key locations of the Birati town such as Birati Bus Stop (22065′95″ N, 88°44′14″ E) on the Jessore Road, Birati Railway Station (22066′38″ N, 88°42′71″ E), Pratapgarh auto stand (22067′15″ N, 88°41′82″ E), and Mrinalini Dutta Mahavidyapith (22066′47″ N, 88°42′21″ E) were chosen as central points for the study sites.

### Sampling period and techniques for evaluating species diversity and abundance of avian fauna

The present study was conducted from January 2023 to December 2023, with weekly visits to each study site between 6 AM and 4 PM under normal weather conditions, without the presence of strong winds and heavy rainfall.

The point count method was employed to assess the relative abundances of individual bird species at the four selected study sites. This method involves counting birds from a fixed location for a set duration and can be conducted at any

time of the year, not just during the breeding seasons (33-35).

At each study site, two transect points were randomly chosen, with a distance of approximately 200 meters between them to reduce the chance of mistakenly counting the same individual species multiple times during the survey. Observations at each transect point lasted for 20 minutes, with visibility ranging from 10 to 100 meters on either side of the transect (28, 33-35).

Sampling occurred twice a day - once in the morning starting at 6 AM and once in the evening starting at 4 PM - once a week for twelve consecutive months (January 2023 to December 2023). During the present survey, books authored by Grimmett *et al*. (2011) and Arlott (2015) were used as field guides for identifying bird species.

Detailed data, such as the date, location, and number of birds counted, were meticulously recorded. During the study Nikon 8×40 zoom binoculars were used to aid in spotting and identifying bird species. Additionally, bird photography was conducted in the field using a Nikon D3300 camera and an AF-P Nikkor 70-300 mm f/4.5-6.3 G ED VR lens.

Bird species were categorized into four groups based on their frequency of sightings: abundant (A), common (C), uncommon (U), and rare (R). During this one-year survey, bird species observed 90 times or more were categorized as abundant, those seen 60-89 times were classified as common, those recorded 31-59 times were considered uncommon, and species sighted 1-30 times were labeled as rare. This classification system served as a systematic framework for evaluating and presenting the species diversity and abundance of avian fauna in the present investigation.

**Results and conclusion**

Conservation of ecosystems with high biodiversity is crucial because they provide essential ecological services, enhance resilience to environmental changes, and support human well-being. The conservation of biodiversity in urban ecosystems is an urgent necessity owing to the rapid pace of urbanization and the growing impact of human development [23, 36]. Urbanization, marked by high population density, widespread infrastructure expansion, and significant alterations in land use, frequently puts substantial strain on local ecosystems. Green spaces in urban environments, such as parks, gardens, and urban forests, act as habitats for a variety of plant, animal, and microbial species. These species play vital roles in maintaining ecological balance and providing essential ecosystem services. Conserving biodiversity in urban areas is essential for maintaining overall ecological balance, promoting human well-being, and facilitating sustainable urban living, ensuring the long-term sustainability of urban ecosystems [15, 18-20, 23, 36].

To actively monitor and devise effective strategies for preserving biodiversity in urban regions, it is imperative to first assess the current biodiversity status. This entails focusing particularly on the richness and abundance of ecologically important species within the specific locality of concern.

Studying bird diversity in an area is crucial for several reasons. Birds play key roles in ecosystems, including pollination, seed dispersal, pest control, and nutrient cycling, making their conservation essential for maintaining ecosystem function [4-9]. Additionally, birds serve as indicators of ecosystem health, reflecting alterations in vegetation, habitat quality, climate conditions, and pollution levels through their presence, absence, population shifts, or behavior [4-10]. Monitoring bird populations provides valuable insights into broader ecological patterns and helps identify areas in need of conservation attention, as birds are sensitive to disturbances, vegetation changes, and microclimate variations [4-8, 15]. Understanding the distribution and diversity of avifauna enriches our knowledge of the natural world and helps shape conservation efforts aimed at preserving biodiversity and ensuring the long-term health of ecosystems for both wildlife and human populations.

Therefore, the author undertook the task of evaluating the species diversity and abundance of avian fauna in Birati, a densely populated town located in the North 24 Parganas district of West Bengal. This initiative was driven by the lack of any previously published reports on the diversity and abundance of bird species in the town. The present study, conducted over the course of one year (from January 2023 to December 2023), represents the culmination of research focusing on the variety and abundance of avian fauna in the town. Although the present author previously conducted a study on the diversity and abundance of butterfly species in Birati, there is no published report available on the species richness and abundance of avian fauna in the aforementioned town. [32]. This current study is the first attempt to explore, identify, and record the various species of birds and their distribution in the aforesaid town.

Birati, a suburban town in the North 24 Parganas district of West Bengal, boasts a high population density. The town is characterized by predominantly residential areas interspersed with large water bodies, vacant plots of land, playgrounds, and parks. Its vegetation primarily comprises flowering shrubs, bushy herbs, and numerous large woody trees, which are planted for both aesthetic and environmental benefits. In the northern and northwestern parts of Birati, the landscape transitions to marshy areas, where ferns, herbaceous plants, and Phragmites are abundant. These marshes contribute to the lush, green landscape and support various wildlife species.

Abhay Ashram, a social welfare organization established in 1924, is located next to Mrinalini Dutta Mahavidyapith, one of the central points of the study sites. Abhay Ashram deserves special mention owing to its expansive green campus, spanning over 6 acres and featuring flower gardens, numerous large trees, and a large pond.

During the present study, a total of 70 bird species from 60 genera were recorded in Birati town. These bird species were distributed across 30 families and 12 different orders [Figures 2-4, Table 1]. The highest number of species was observed under the order Passeriformes, with 33 different species [Table 1]. The second highest number of species was recorded under the order Piciformes, with 7 species, followed by the orders Pelecaniformes and Cuculiformes, each with 5 species [Figures 2-4, Table 1]. The orders Columbiformes and Coraciiformes each had 4 species recorded during the present study. The orders

Accipitriformes and Gruiformes were each represented by 3 species, while the orders Anseriformes and Suliformes had 2 species each. Lastly, the orders Caprimulgiformes and Psittaciformes each had 1 species recorded during the study [Figures 2-4, Table 1].

In the present study, the order Passeriformes was represented by the highest number of families (17 families), whereas the orders Coraciiformes and Piciformes were represented by 2 families each [Figures 2-4, Table 1]. The families Ardeidae, Cuculidae, and Picidae had the highest number of bird species (5 each) recorded, indicating a high species diversity within these families in the town. Families like Columbidae and Sturnidae each had 4 species recorded during the study. In the town, several bird families like Apodidae, Meropidae, Aegithinidae, Alaudidae, Laniidae, Passeridae, Ploceidae, Turdidae, and Psittaculidae were represented by a single species each [Figures 2-4, Table 1].

After analyzing the sighting data of various bird species in the town, 12 species were found to be rare, 24 species were identified as uncommon, 18 species were categorized as common, and 16 species were classified as abundant [Figure 5, Table 1]. These results indicate that among the 70 bird species recorded in Birati town during the one-year study, more than 48% of the species are frequently sighted or present in good numbers in the study area.

The current investigation revealed that a large portion of the bird genera recorded in the town, specifically 50 out of 60, were represented by only one species each. Additionally, ten other bird genera were identified in the town, each represented by two species. The findings of the current study have revealed a bird community in Birati town with a significantly low species to genera ratio (S/G = 1.2).

Results from the present study indicate that the order Passeriformes, with 33 different species, exhibits the highest species diversity and abundance among the 12 different orders of birds observed in Birati town [Figure 2, Table 1]. More than 47% of the total bird species recorded in the town during the one-year study belong to the order Passeriformes. This result is not surprising because the order of birds with the highest number of species globally is Passeriformes [3, 30-31]. This order includes more than half of all bird species and is characterized by a great diversity of forms and sizes [1-3, 30, 31]. The order Passeriformes encompass a wide variety of birds such as sparrows, finches, bulbuls and crows [30-31]. Their adaptability to different habitats and their varied diets may contribute to their extensive species diversity observed during the present study.

Analysis of data on seasonal fluctuations in bird populations revealed peak abundance during the spring and winter seasons (November to March). These variations can be attributed to favorable climate conditions and the availability of abundant food and suitable habitats during the aforementioned period in the study area.

Among the chosen study sites, Abhay Ashram (located adjacent to Mrinalini Dutta Mahavidyapith) and the marshes in the northern and northwestern parts of the town (located near Pratapgarh auto stand) have emerged as prime locations for bird sightings, with a significantly higher number of species documented in these areas compared to other sites. The increase in bird sightings in these areas is likely due to the presence of significantly greater vegetation and a variety of plants, which provide green spaces in urban areas that support and sustain the diversity of avian fauna.

The present study is the first comprehensive analysis of the diversity and distribution of avian fauna in Birati, a town situated in the North 24 Parganas district of West Bengal, where no previous research on this subject has been conducted or published. Despite being predominantly characterized by densely populated urban areas, the town surprisingly harbors a rich diversity of bird species. Small green enclaves, such as Abhay Ashram, along with the marshes in the northern and northwestern parts of the town, significantly contribute to the recorded variety and abundance of avian fauna by acting as havens for a diverse assemblage of plant and animal species thriving amidst the urban hustle.

Birds are frequently used in educational programs to inspire conservation endeavors and foster admiration for wildlife and biodiversity. In addition to cataloging the existing species diversity and abundance of avian fauna in Birati town, the current study lays the groundwork for further investigation into the town's existing biodiversity. With its diverse vegetation and habitats, the town holds the potential to support and sustain various life forms. This underscores the importance of earnest attention from authorities for effective monitoring and conservation measures. Such endeavors are imperative for safeguarding the town's flora and fauna, given their pivotal roles in ecosystem services and overall environmental well-being.

**Acknowledgement**

The author expresses heartfelt gratitude to Smt. Sangita Ghosh, Assistant Teacher at Kachua Deshbandhu High School (H.S.), North 24 Parganas, West Bengal, for her invaluable assistance during this one-year study. An expert bird watcher, she accompanied the author on every field trip and actively participated in identifying various bird species.

**Table 1:** Diversity and abundance of avian species observed in Birati town during the present study.

| Sl. No. | Scientific Name | Common Name | Status |
|---|---|---|---|
| Order: Accipitriformes Family: Accipitridae | | | |
| 1. | *Gyps bengalensis* (J.F. Gmelin, 1788) | White-rumped Vulture | U |
| 2. | *Milvus migrans* (Boddaert, 1783) | Black Kite | C |
| 3. | *Accipiter badius* (Gmelin, 1788) | Shikra | U |
| Order: Anseriformes Family: Anatidae | | | |
| 4. | *Anas platyrhynchos* (Linnaeus, 1758) | Mallard | C |
| 5. | *Anser anser* (Linnaeus, 1758) | Greylag Goose | C |
| Order: Caprimulgiformes Family: Apodidae | | | |
| 6. | *Apus affinis (Gray, 1830)* | Little Swift | U |
| Order: Columbiformes Family: Columbidae | | | |
| 7. | *Columba livia* (J.F. Gmelin, 1789) | Rock Pigeon | A |
| 8. | *Spilopelia chinensis* (Scopoli, 1786) | Spotted Dove | A |

| | | | |
|---|---|---|---|
| 9. | *Streptopelia decaocto* (Frivaldszky, 1838) | Eurasian Collared Dove | U |
| 10. | *Treron phoenicopterus* (Latham, 1790) | Yellow-footed Green Pigeon | U |
| Order: Coraciiformes Family: Alcedinidae | | | |
| 11. | *Alcedo atthis* (Linnaeus, 1758) | Common Kingfisher | C |
| 12. | *Halcyon pileata* (Boddaert, 1783) | Black-capped Kingfisher | U |
| 13. | *Halcyon smyrnensis* (Linnaeus, 1758) | White-throated Kingfisher | A |
| Order: Coraciiformes Family: Meropidae | | | |
| 14. | Merops orientalis (Latham, 1801) | Green Bee-eater | A |
| Order: Cuculiformes Family: Cuculidae | | | |
| 15. | *Centropus sinensis* (Stephens, 1815) | Greater Coucal | R |
| 16. | *Centropus bengalensis* (Gmelin, 1788) | Lesser Coucal | U |
| 17. | *Clamator jacobinus* (Boddaert, 1783) | Pied Cuckoo | U |
| 18. | *Eudynamys scolopaceus* (Linnaeus, 1758) | Asian Koel | C |
| 19. | *Hierococcyx varius* (Vahl, 1797) | Common Hawk Cuckoo | C |
| Order: Gruiformes Family: Rallidae | | | |
| 20. | *Amaurornis phoenicurus* (Pennant, 1769) | White-breasted Waterhen | A |
| 21. | *Porphyrio poliocephalus* (Latham, 1801) | Purple Swamphen | U |
| 22. | *Gallinula chloropus* (Linnaeus, 1758) | Common Moorhen | R |
| Order: Passeriformes Family: Aegithinidae | | | |
| 23. | *Aegithina tiphia* (Linnaeus, 1758) | Common Iora | C |
| Order: Passeriformes Family: Alaudidae | | | |
| 24. | *Alauda gulgula* (Franklin, 1831) | Oriental Skylark | U |
| Order: Passeriformes Family: Cisticolidae | | | |
| 25. | *Orthotomus sutorius* (Pennant, 1769) | Common Tailorbird | A |
| 26. | *Cisticola juncidis* (Rafinesque, 1810) | Zitting Cisticola | U |
| Order: Passeriformes Family: Corvidae | | | |
| 27. | *Corvus macrorhynchos* (Wagler, 1827) | Large-billed Crow | U |
| 28. | *Corvus splendens* (Vieillot, 1817) | House Crow | A |
| 29. | *Dendrocitta vagabunda* (Latham, 1790) | Rufous Treepie | C |
| Order: Passeriformes Family: Dicruridae | | | |
| 30. | *Dicrurus aeneus* (Vieillot, 1817) | Bronzed Drongo | U |
| 31. | *Dicrurus macrocercus* (Vieillot, 1817) | Black Drongo | A |
| Order: Passeriformes Family: Estrildidae | | | |
| 32. | *Amandava amandava* (Linnaeus, 1758) | Red Munia | C |
| 33. | *Lonchura atricapilla* (Vieillot, 1807) | Chestnut Munia | C |
| 34. | *Lonchura punctulata* (Linnaeus, 1758) | Scaly-breasted Munia | C |
| Order: Passeriformes Family: Laniidae | | | |
| 35. | *Lanius schach* (Linnaeus, 1758) | Long-tailed Shrike | U |
| Order: Passeriformes Family: Leiothrichidae | | | |
| 36. | *Argya caudata* (Dumont, 1823) | Common Babbler | C |
| 37. | *Argya striata* (Dumont, 1823) | Jungle Babbler | A |
| Order: Passeriformes *Family:* Motacillidae | | | |
| 38. | *Anthus rufulus* (Vieillot, 1818) | Paddyfield Pipit | R |
| 39. | *Motacilla alba* (Linnaeus, 1758) | White Wagtail | R |
| Order: Passeriformes Family: Muscicapidae | | | |
| 40. | *Copsychus saularis* (Linnaeus, 1758) | Oriental Magpie-Robin | C |
| 41. | *Cyornis rubeculoides* (Vigors, 1831) | Blue-throated Flycatcher | R |
| 42. | *Ficedula albicilla* (Pallas, 1811) | Taiga Flycatcher | R |
| Order: Passeriformes Family: Nectariniidae | | | |
| 43. | *Cinnyris asiaticus* (Latham, 1790) | Purple Sunbird | A |
| 44. | *Leptocoma zeylonica* (Linnaeus, 1766) | Purple-rumped Sunbird | U |
| Order: Passeriformes Family: Oriolidae | | | |
| 45. | *Oriolus traillii* (Vigors, 1832) | Maroon Oriole | U |
| 46. | *Oriolus xanthornus* (Linnaeus, 1758) | Black-hooded Oriole | C |
| Order: Passeriformes Family: Passeridae | | | |
| 47. | *Passer domesticus* (Linnaeus, 1758) | House Sparrow | A |
| Order: Passeriformes Family: Ploceidae | | | |
| 48. | *Ploceus benghalensis* (Linnaeus, 1758) | Black-breasted Weaver | U |
| Order: Passeriformes Family: Pycnonotidae | | | |
| 49. | *Pycnonotus cafer* (Linnaeus, 1766) | Red-vented Bulbul | A |
| 50. | *Pycnonotus jocosus* (Linnaeus, 1758) | Red-whiskered Bulbul | U |
| Order: Passeriformes Family: Sturnidae | | | |
| 51. | *Acridotheres fuscus* (Wagler, 1827) | Jungle Myna | A |
| 52. | *Acridotheres tristis* (Linnaeus, 1766) | Common Myna | A |
| 53. | *Gracupica contra* (Linnaeus, 1758) | Asian Pied Starling | U |
| 54. | *Sturnus vulgaris* (Linnaeus, 1758) | Common Starling | U |
| Order: Passeriformes Family: Turdidae | | | |
| 55. | *Geokichla citrina* (Latham, 1790) | Orange-headed Thrush | R |

| | | | |
|---|---|---|---|
| Order: Pelecaniformes Family: Ardeidae | | | |
| 56. | *Ardeola grayii* (Sykes, 1832) | Indian Pond Heron | A |
| 57. | *Bubulcus coromandus* (Boddaert, 1783) | Eastern Cattle Egret | A |
| 58. | *Nycticorax nycticorax* (Linnaeus, 1758) | Black-crowned Night Heron | U |
| 59. | *Ardea cinerea* (Linnaeus, 1758) | Grey Heron | C |
| 60. | *Butorides striata* (Linnaeus, 1758) | Striated Heron | R |
| Order: Piciformes Family: Picidae | | | |
| 61. | *Chrysocolaptes guttacristatus* (Tickell, 1833) | Greater Flameback | U |
| 62. | *Dendrocopos macei* (Vieillot, 1818) | Fulvous-breasted Woodpecker | R |
| 63. | *Dinopium benghalense* (Linnaeus, 1758) | Black-rumped Flameback | R |
| 64. | *Micropternus brachyurus* (Vieillot, 1818) | Rufous Woodpecker | R |
| 65. | *Picus chlorolophus* (Vieillot, 1818) | Lesser Yellow-naped Woodpecker | R |
| Order: Piciformes Family: Megalaimidae | | | |
| 66. | *Psilopogon asiaticus* (Latham, 1790) | Blue-throated Barbet | U |
| 67. | *Psilopogon haemacephalus* (Müller, 1776) | Coppersmith Barbet | C |
| Order: Psittaciformes Family: Psittaculidae | | | |
| 68. | *Psittacula alexandri* (Linnaeus, 1758) | Red-breasted Parakeet | U |
| Order: Suliformes Family: Phalacrocoracidae | | | |
| 69. | *Microcarbo niger* (Vieillot, 1817) | Little Cormorant | C |
| 70. | *Phalacrocorax fuscicollis* (Stephens, 1826) | Indian Cormorant | C |
| A = Abundant; C = Common; U = Uncommon; R = Rare | | | |

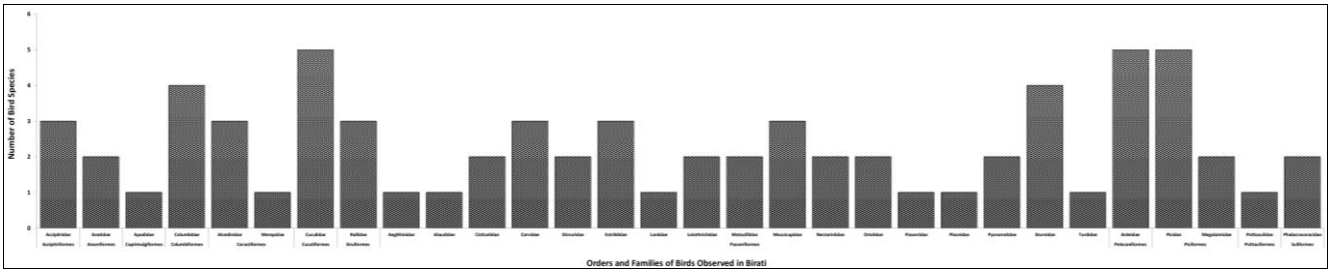



**Fig 2:** Orders and families of birds observed in Birati town during the present survey.

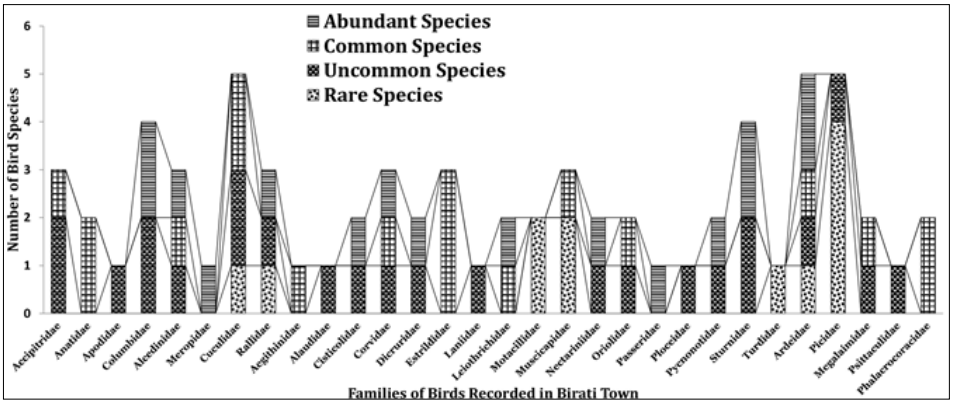



**Fig 3:** Distribution of species (based on frequency of sightings) in each bird family as recorded in Birati town during the present survey.

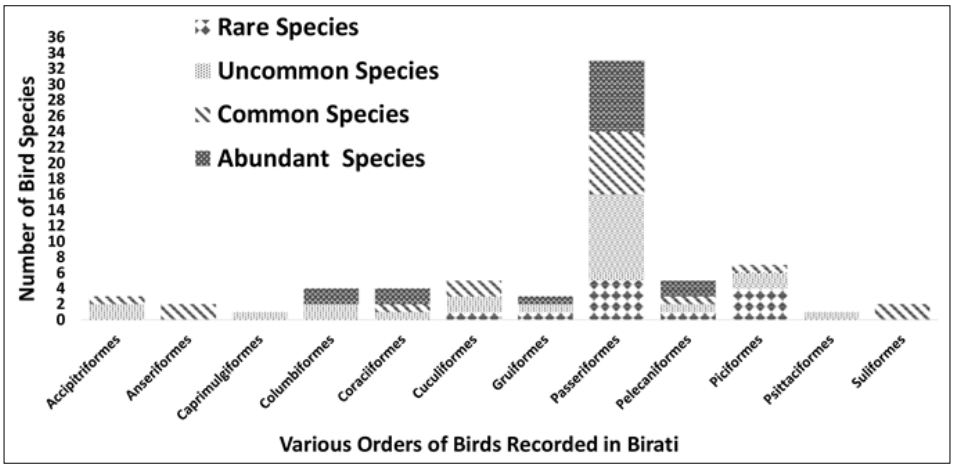



**Fig 4:** Distribution of species (based on frequency of sightings) in each bird order as recorded in Birati town during the present survey.

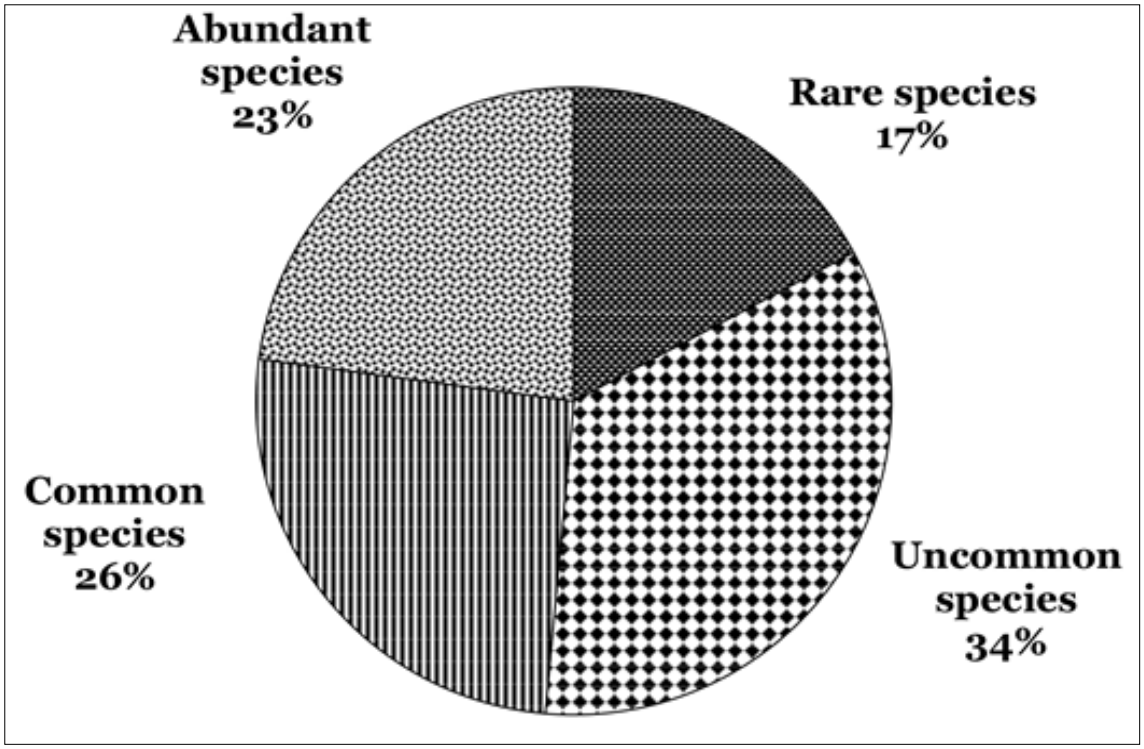



**Fig 5:** Distribution of bird species (based on frequency of sightings) observed in Birati town during the present study.

**References**


1. Hickman CP, Keen S, Larson A, *et al*. Integrated Principles of Zoology, Nineteenth Edition. McGraw-Hill Education: New York, 2024.
2. Miller SA, Tupper TA. Zoology, Twelfth Edition. McGraw-Hill Education: New York, 2024.
3. Pough FH, McGuire B, Bemis WE, and Janis CM. Vertebrate Life, Eleventh Edition. Oxford University Press: New York, 2023.
4. Sekercioglu, Çagan H., Wenny, Daniel G. and Whelan, Christopher J. Why Birds Matter: Avian Ecological Function and Ecosystem Services, Chicago: University of Chicago Press, 2016. https://doi.org/10.7208/9780226382777
5. Whelan CJ, Wenny DG, Marquis RJ. Ecosystem services provided by birds. Annals of the New York Academy of Sciences,2008:1134(1):25-60.
6. Sekercioglu CH. Increasing awareness of avian ecological function. Trends in Ecology & Evolution,2006:21(8):464-471.
7. Wenny DG, *et al*. The need to quantify ecosystem services provided by birds. The Auk,2011:128(1):1-14.
8. Şekercioğlu ÇH, Daily GC, Ehrlich PR. Ecosystem consequences of bird declines. Proceedings of the National Academy of Sciences,2004:101(52):18042-18047.
9. Şekercioğlu ÇH. Bird functional diversity and ecosystem services in tropical forests, agroforests and agricultural areas. Journal of Ornithology,2012:153(S1):153-161.
10. Aubry KB, Raley CM. The Pileated Woodpecker as a Keystone Habitat Modifier in the Pacific Northwest, USDA Forest Service Gen. Tech. Rep.,2002:181:257-274.
11. Paine RT. Food web complexity and species diversity, American Naturalist,1966:100:65-75.
12. Morales MB, Merencio Á, de la Morena ELG. Evaluation of a potential umbrella species using favourability models: the case of the endangered little bustard (Tetrax tetrax) and steppe birds. Biodivers Conserv,2023:32:3307-3327. https://doi.org/10.1007/s10531-023-02655-2
13. Crosby AD, Elmore RD, Leslie DM, *et al*. Looking beyond rare species as umbrella species: Northern Bobwhites (Colinus virginianus) and conservation of grassland and shrubland birds. Biological Conservation,2015:186:233-240.
14. Betrus CJ, Fleishman E, Blair RB. Cross taxonomic potential and spatial transferability of an umbrella species index. Journal of Environmental Management,2005:74:79-87.
15. Beissinger SR, Osborne DR. Effects of urbanization on avian community organization. Condor,1982:84:75-83.
16. Gil D, Brumm H (Eds). Avian Urban Ecology: Behavioral and Physiological Adaptations, First Edition. Oxford University Press: United Kingdom, 2014.
17. Murgui E, Hedblom M (Eds). Ecology and Conservation of Birds in Urban Environments. Springer International Publishing AG: New York, 2017.
18. Blair RB. Birds and butterflies along an urban gradient: surrogate taxa for assessing biodiversity. Ecological applications,1999:9(1):164-170.
19. Blair RB. Land use and avian species diversity along an urban gradient. Ecol Appl,1996:6:506-519.
20. Chace JF, Walsh JJ. Urban effects on native avifauna: A review. Landsc Urban Plan,2006:74:46-69.
21. Daily GC, Ehrlich PR, Haddad NM. Double keystone bird in a keystone species complex. Proc Natl Acad Sci USA,1993:90(2):592-594.
22. Diamond JM. Urban extinction of birds. Nature,1988:333:393-394.

23. Dearbon DC, Kark S. Motivations for Conserving Urban Biodiversity. Conservation Biology,2010:24(2):432-440.
24. Marchese C. Biodiversity hotspots: A shortcut for a more complicated concept. Glob. Ecol. Conserv,2015:3:297-309.
25. Praveen J, Jayapal R, Pittie A. A checklist of the birds of India. Indian Birds,2016:11:113-170.
26. Makwana VM, Dodia PP. Gaurishankar Lake (Bortalav): A paradise for avifaunal diversity in the urban area of Bhavnagar, Gujarat, India. International Journal of Entomology Research,2022:7(3):55-68.
27. Rani R, Kampa S. Diversity & abundance of avifauna in four different habitats Boudh district Odisha, India. International Journal of Entomology Research,2023:8(3):90-97.
28. Shome S, Roy S, Aich A. A study on the diversity and abundance of the butterfly and bird species in Belgharia town of North 24 Parganas District, West Bengal. J. Exp. Zool. India,2018:21(2):1343-1351.
29. Rangnekar SS, Kulkarni MN. Avian fauna for post monsoon period in Tadoba- Andhari Tiger Reserve. International Journal of Entomology Research,2022:7(1):33-35.
30. Grimmett R, Inskipp C, Inskipp T. Birds of the Indian Subcontinent, Second Edition. Christopher Helm, an imprint of Bloomsbury Publishing Plc: United Kingdom, 2011.
31. Arlott N. Collins Field Guide: Birds of India, First Edition. William Collins, An imprint of Harper Collins Publishers: London, 2015.
32. Shome S. An investigation of the diversity and abundance of the butterfly (Insecta: Lepidoptera) species in Birati town of North 24 Parganas district, West Bengal. International Journal of Entomology Research,2024:9(2):34-39.
33. Henderson PA, Southwood TRE. Ecological Methods, Fourth Edition. Wiley-Blackwell: New York, 2016.
34. Buckland ST, Anderson DR, Burnham KP, *et al*. Introduction to Distance Sampling, First Edition. Oxford University Press: United Kingdom, 2001.
35. Sutherland WJ (Eds). Ecological Census Techniques: A Handbook, Second Edition. Cambridge University Press: London, 2006.
36. Savard JL, Clergeau P, and Mennechez G. Biodiversity concepts and urban ecosystems. Landscape and Urban Planning,2004:8(3-4):131-142.