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COMMUNICATION

AN APPRAISAL OF AVIAN SPECIES DIVERSITY IN AND AROUND PURULIA TOWN, WEST BENGAL, INDIA

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An appraisal of avian species diversity in and around Purulia Town, West Bengal, India

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Abstract: Purulia, the westernmost district of West Bengal, India is least explored with respect to the biological diversity and relatively little information is available to date. The present study was conducted from February 2017 to January 2018 to document avifaunal diversity in Purulia Town and surroundings. Sampling was done through the line transect method with photographic documentation and subsequent identification following suitable keys. Species richness and seasonal abundance were calculated. Altogether, 115 species of birds belonging to 19 orders and 43 families were recorded during the study period. Passeriformes was the most dominant order represented by 46 species during the study. The Shannon-Wiener (H’) value was highest for January (1.564). A large number of migratory birds visit Purulia every year mostly during winter and it is reflected in the present study. Diverse foraging habit among the birds was represented by 46 species during the study. 76 species (66%) were insectivores, 9 species (8%) omnivorous and 31 species (27%) carnivores. The diversity index is highest for January (1.564). The winter season is the best season for ornithological exploration of the area. The avifauna of Purulia Town and its surroundings will provide an insight into the species diversity and conservation aspects of birds and their habitats.

Keywords: Bird, feeding guild, species diversity, species richness.
INTRODUCTION

About 10,721 species of birds are living in this planet (Billerman et al. 2020) distributed from the polar regions to the tropical forests and are even prominent in the highly populated metropolitan cities. Approximately, 75% and 45% of total bird species around the globe are adapted to forest habitats and human-modified habitats, respectively (BirdLife International 2018), where they play important role in pollination, seed dispersal, pest control, and act as an indicator of a healthy environment (Hadley et al. 2012; Ramachandra 2013). Birds play a crucial role in plant pollination; through their faeces, they carry seeds and initialize the distribution of plants to distant places; act as scavengers, which help in ecological decomposition. Birds are considered good ecological indicators as they exploit all trophic levels in a food chain acting as herbivore, carnivore, or omnivore. They respond to the qualitative and/or quantitative changes in the environment and usually indicate the secondary changes in their surroundings (Morrison 1986; Koskimies 1989). Population dynamics of bird species may indicate natural disasters like drought (Blake et al. 1994) or anthropogenic stress like the introduction of new species in the ecosystem and urbanization (Savidge 1984; O’Connell et al. 2000).

Habitat loss is one of the key factors responsible for the rapid decline of the avian species population (Prasad et al. 2014). Anthropogenic activities like agriculture, urbanization, and firewood collection have contributed to deforestation and the simultaneous habitat degradation of the bird communities that affect the variety and variability of bird population (Storch et al. 2003). Understanding the changes in the diversity and abundance of the birds linked with the degradation of the natural habitats and ecosystems could help in framing necessary conservation actions.

Avian species diversity and distribution are not consistent with the landscape (Bibby et al. 1992). The pattern of biodiversity changes with environmental factors, climatic conditions, topography and habitats (Rodriguez-Estrella 2007; Jankowiski et al. 2009). Purulia is the westernmost district of West Bengal, India, and is topographically an undulated land which is the eastern part of Chotanagpur plateau. This district faces severe water scarcity in summer. Plants like Palash Butea monosperma, Kusum Schleichera oleosa, Mahua Madhuca longifolia, Neem Azadirachta indica, Kend Diospyros melanoxylon, Haritaki Terminalia chebula, Amla Phyllanthus emblica, Karange Pongamia pinnata, Bamboo Bambusa spp. which can tolerate drought, flourish in this district (Das 2016; Samanta et al. 2017). Purulia has been least explored concerning the biological diversity and relatively little published information is available to date (Das 2016; Samanta et al. 2017; Das 2018). In this circumstance, to enrich the knowledge on the biodiversity profile, an attempt was made to update the information about birds of Purulia Town and surroundings for the diversity and seasonal abundance. The main objective of the study was to determine bird species diversity and abundance to prepare a checklist of birds as well as to create awareness among the local people of Purulia to help maintain the ecological balance.

MATERIALS AND METHODS

Study Site

The present study was carried out to document the avifaunal diversity from February 2017 to January 2018 in and around Purulia Town (23.33 N; 86.36 E), Purulia, West Bengal, India. Five locations, namely, Ketika, Sidho-Kanho-Birsha University campus, Saheb Bandh, Surulia Deer Park, and Kansai river-side, situated in and around the town were selected for the study (Fig. 1). Ketika, situated about 2 km from Purulia railway station, is a well-wooded residential area with trees, bushes, open lands with intermittent small ponds, and ditches. Sidho-Kanho-Birsha University campus is a vast open land with scattered bushes and trees. Saheb Bandh is a large man-made lake with some vegetation surrounding it. Surulia Deer Park is an urban forest with a mini zoo inside it. Kansai river-side was the area around the bank of river Kansai flowing by the south boundary of the town.

Data collection

Each study site was visited once a month. Line transect method was employed to record avifaunal richness and abundance (Hutto et al. 1986; Bibby et al. 1992; Buckland et al. 2004). The field surveys were conducted at 06.30–07.30 h, 12.00–13.00 h, and 16.30–17.30 h, and the values were averaged to obtain representative data of a particular count (Gibbons & Gregory 2006).

From the starting spot of any predetermined route, the bird species or their calls were recorded along either side of the transect. The starting point and the direction of transects were often random. The length of the route often varied due to topography, roads, water body that limited access. The opportunistic counts of birds during other times and other places were also included to
document a comprehensive checklist (Hossain & Aditya 2016).

Following visual observation or hearing a bird’s call the presence of the birds was confirmed with the help of a binocular (Olympus 8 × 40 DPS1) and photographs were taken with digital cameras (Nikon Coolpix P520 and Canon 1200d, 55–250mm lens). Based on the visual observations and photographs, birds were identified following standard guidebooks (Ali 2002; Grimmett et al. 2011). Monthly data obtained from the one-year study was divided into four seasons: summer (March to May), monsoon (June to August), post-monsoon (September to November), and winter (December to February) to compare seasonal variations in avian species richness and abundance.

Species richness and diversity were calculated using Biodiversity Pro software (McAleece et al. 1997). The bird species diversity was calculated using the Shannon-Wiener diversity index \( H' = \sum p_i \ln p_i \) and Shannon diversity index \( H_{\text{max}} = \log_e S \). Measurement of Shannon’s evenness index was calculated using the following formula \( J = H' / H_{\text{max}} \) \( p_i = \) proportion of total sample belonging to \( i^{th} \) species, \( S = \) total number of species in habitats (species richness) (Magurran 2004).

Migratory status and feeding habits of the enlisted birds was determined by personal observation as well as information available in the literature (Ali 2002; Grimmett et al. 2011; Birdlife International 2018).

**RESULTS**

In the present study, 115 species of birds consisting of 19 orders and 43 families were recorded in and around Purulia Town (Table 1; image 1a, b). Passeriformes was found to be the most dominant order represented by 46 species (Fig. 2). Among the families, Anatidae was represented by the highest of nine species (Table 1). The residential status of the recorded birds shows that 78 species of birds were a permanent resident of Purulia, 36 bird species were winter migrants, and only one species Jacobin Cuckoo *Clamator jacobinus* was a summer migrant (Table 1). Among the winter migrants, Red-Crested Pochard *Netta rufina*, Northern Shoveler *Anas clypeata*, Garganey *Spatula querquedula*, Eurasian Wigeon *Mareca penelope*, Northern Pintail *Anas acuta*, Gadwall *Mareca strepera*, and Ferruginous Duck *Aythya nyroca* took shelter in the Saheb Bandh, Purulia. Among the 115 species of birds, 43 species were partly or completely dependent on water bodies.

The species richness value was highest in the winter season (104) and in December (99); whereas, this was lowest in Monsoon (69) and in August (61) (Table 4). The overall avian diversity index \( (H') \) for the town and surroundings was 3.66. The biodiversity index was also calculated month-wise (Fig. 3) and it depicts that the Shannon-Wiener \( (H') \) value was highest for January (1.564) though the \( H' \) value does not differ significantly for the rest of the months. Shannon evenness \( (J') \) value was lowest in December (0.767) and highest for July (0.857).

Feeding guilds included invertivorous, granivorous, nectarivorous, frugivorous, omnivorous, carnivorous, and herbivorous categories (Table 1, Fig. 4). Among the invertivorous birds, insectivorous and molluscivorous species specialized for feeding on only insects and mollusks (Table 1, Fig. 4) were considered. Omnivorous birds (29%) were found in the highest number followed by invertivores (26%), carnivores (25%), granivore (8%), herbivore (7%), frugivore (3%), and nectarivore (2%). Of all invertivores, insectivores represented 70% in number (Fig. 4).

**DISCUSSION**

As evident from the present study, Purulia Town and its surrounding places nurture a widely diversified
Avian group with its arid environment, wild flora, the fragmented agricultural field, plantation, and gardens that provides a complex landscape. The study area is moderately rich with its avifauna with 115 species, and when compared with previous observations in different parts of India it has been found that the species richness at Purulia (Table 2) was lower than the values reported for Burdwan (144) (Hossain & Aditya 2016), and the surrounding area of western Kachchh (252) (Gajera et al. 2013). But the avian diversity was higher than that reported for Kolkata surroundings (48 species) (Sengupta et al. 2014). Shannon diversity index (H') for the present study (3.66) was found to be higher than the Silent Valley (3.3) and moist deciduous forest of Mukkali (3.45) (Jayson & Mathew 2000), which indicates that Purulia Town possesses a rich avian diversity.

The present species richness value is greater than the richness values for Purulia Saheb bandh (24 species)
Table 1. Checklist of birds found in Purulia Town and surroundings with their seasonal occurrence, residential status, species abundance ($P^i$ value), and feeding habits.

| Scientific name                                                                 | Common name                      | Seasonal occurrence | Status' | $P^i$ value | Feeding habit^ |
|----------------------------------------------------------------------------------|----------------------------------|---------------------|---------|-------------|----------------|
| **ORDER 1: Accipitriformes**                                                      |                                  |                     |         |             |                |
| **Family: Accipitridae**                                                          |                                  |                     |         |             |                |
| 1. Accipiter badius (Gmelin, 1788)                                               | Shikra                           | ALL                 | R       | 0.00173     | C              |
| 2. Milvus migrans (Boddart, 1783)                                               | Black Kite                       | ALL                 | R       | 0.00479     | C              |
| 3. Pernis ptilorhynchus (Temminck, 1821)                                         | Oriental Honey Buzzard           | S, W                | R       | 0.00005     | C              |
| 4. Circus aeruginosus (Linnaeus, 1758)                                           | Western Marsh Harrier            | W                   | WM      | 0.00002     | C              |
| **ORDER 2: Anseriformes**                                                         |                                  |                     |         |             |                |
| **Family: Anatidae**                                                              |                                  |                     |         |             |                |
| 5. Dendrocygna javanica (Horsfield, 1821)                                         | Lesser Whistling Duck            | ALL                 | R       | 0.12926     | G              |
| 6. Netta rufina (Pallas, 1773)                                                   | Red-Crested Pochard              | S, PM, W            | WM      | 0.01085     | G              |
| 7. Nettapus coromandelanus (Gmelin, 1789)                                         | Cotton Pygmy Goose              | ALL                 | WM      | 0.00191     | H              |
| 8. Anas clypeata (Linnaeus, 1758)                                               | Northern Shoveler                | S, PM, W            | WM      | 0.00511     | O              |
| 9. Spatula querquedula (Linnaeus, 1758)                                          | Garganey                         | S, W                |         | 0.00041     | O              |
| 10. Mareca penelope (Linnaeus, 1758)                                            | Eurasian Wigeon                  | PM                  | WM      | 0.00002     | H              |
| 11. Anas acuta (Linnaeus, 1758)                                                  | Northern Pintail                 | S, PM, W            | WM      | 0.00702     | H              |
| 12. Mareca strepera (Linnaeus, 1758)                                            | Gadwall                          | S, PM, W            | WM      | 0.00629     | H              |
| 13. Aytha nyroca (Güldenstädt, 1770)                                            | Ferruginous Duck                 | W                   |         | 0.00010     | O              |
| **ORDER 3: Apodiformes**                                                          |                                  |                     |         |             |                |
| **Family: Apodidae**                                                             |                                  |                     |         |             |                |
| 14. Cygnus barbatusis (J.E. Gray, 1829)                                          | Asian Palm Swift                 | ALL                 | R       | 0.01229     | I              |
| 15. Apus affinis (J.E. Gray, 1830)                                              | Little Swift                     | ALL                 | R       | 0.01775     | I              |
| **ORDER 4: Bucerotiformes**                                                       |                                  |                     |         |             |                |
| **Family: Upupidae**                                                             |                                  |                     |         |             |                |
| 16. Upupa epops (Linnaeus, 1758)                                                 | Common Hoopoe                    | ALL                 | R       | 0.00049     | I              |
| **Family: Bucerotidae**                                                           |                                  |                     |         |             |                |
| 17. Ocyceros birostris (Scopoli, 1786)                                           | Indian Grey Hornbill             | W                   | R       | 0.00002     | F              |
| **ORDER 5: Charadriiformes**                                                      |                                  |                     |         |             |                |
| **Family: Charadriidae**                                                          |                                  |                     |         |             |                |
| 18. Charadrius dubius (Scopoli, 1786)                                            | Little Ringed Plover             | M, PM, W            | R       | 0.00215     | IV             |
| 19. Vanellus indicus (Boddart, 1783)                                            | Red-wattled Lapwing              | S, W                | R       | 0.00044     | IV             |
| 20. Vanellus malabaricus (Boddart, 1783)                                         | Yellow-wattled Lapwing           | ALL                 | R       | 0.00367     | IV             |
| **Family: Jacanidae**                                                             |                                  |                     |         |             |                |
| 21. Hydrophasianus chirugus (Scopoli, 1786)                                      | Pheasant-tailed Jacana           | ALL                 | R       | 0.00338     | IV             |
| 22. Metopidius indicus (Latham, 1790)                                           | Bronze-winged Jacana            | ALL                 | R       | 0.00605     | O              |
| **Family: Scolopacidae**                                                          |                                  |                     |         |             |                |
| 23. Actitis hypoleucos (Linnaeus, 1758)                                          | Common Sandpiper                 | W                   | WM      | 0.00018     | C              |
| 24. Gallinago gallinago (Linnaeus, 1758)                                         | Common Snipe                     | S, W                | WM      | 0.00128     | O              |
| 25. Calidris temminckii (Leisler, 1812)                                         | Temminck’s Stint                 | W                   | WM      | 0.00175     | IV             |
| **Family: Laridae**                                                              |                                  |                     |         |             |                |
| 26. Gelochelidon nilotica (Gmelin, 1789)                                         | Gull-billed Tern                 | PM, W               | WM      | 0.00167     | I              |
| **ORDER 6: Ciconiiformes**                                                       |                                  |                     |         |             |                |
| **Family: Ciconiidae**                                                           |                                  |                     |         |             |                |
| 27. Anastomus oscitans (Boddart, 1783)                                          | Asian Openbill-Stork             | ALL                 | R       | 0.01043     | M              |
| 28. Leptoptilos javanicus (Horsfield, 1821)                                      | Lesser Adjutant                  | S, M, W             | R       | 0.00023     | C              |
| Scientific name | Common name | Seasonal occurrence | Status | P_value | Feeding habit |
|----------------|-------------|---------------------|--------|---------|---------------|
| ORDER 7 : Columbiformes | | | | | |
| Family: Columbidae | | | | | |
| 29 | Columba livia (Gmelin, 1789) | Rock Pigeon | ALL | R | 0.04163 | G |
| 30 | Spilopelia chinensis (Scopoli, 1768) | Spotted Dove | ALL | R | 0.01801 | G |
| 31 | Streptopelia decaocto (Frivaldszky, 1838) | Eurasian Collared-Dove | ALL | WM | 0.01599 | G |
| 32 | Streptopelia tranquebarica (Hermann, 1804) | Red Turtle Dove | PM, W | R | 0.00026 | H |
| 33 | Treron phoenicopterus (Latham, 1790) | Yellow-footed Green Pigeon | ALL | R | 0.00532 | F |
| ORDER 8 : Coraciiformes | | | | | |
| Family: Alcedinidae | | | | | |
| 34 | Alcedo atthis (Linnaeus, 1758) | Small blue Kingfisher | ALL | R | 0.00461 | C |
| 35 | Ceryle rudis (Linnaeus, 1758) | Pied Kingfisher | ALL | R | 0.00086 | C |
| 36 | Halcyon smyrnensis (Linnaeus, 1758) | White-throated Kingfisher | ALL | R | 0.00469 | C |
| Family: Coraciidae | | | | | |
| 37 | Coracias benghalensis (Linnaeus, 1758) | Indian Roller | ALL | R | 0.00364 | C |
| FAMILY: Meropidae | | | | | |
| 38 | Merops orientalis (Latham, 1802) | Green Bee-eater | S, PM, W | R | 0.03565 | I |
| Family: Campephagidae | | | | | |
| 39 | Coracina macei (Lesson, 1830) | Large Cuckooshrike | PM, W | R | 0.00018 | I |
| ORDER 9 : Cuculiformes | | | | | |
| Family: Cuculidae | | | | | |
| 40 | Centropus sinensis (Stephens, 1815) | Greater Coucal | W | R | 0.00021 | C |
| 41 | Centropus bengalensis (Gmelin, 1788) | Lesser Coucal | ALL | R | 0.00154 | C |
| 42 | Clamator jacobinus (Boddaert, 1783) | Jacobin Cuckoo | S, M, PM | SM | 0.0013 | O |
| 43 | Hierococcyx varius (Vahl, 1797) | Common Hawk-Cuckoo | ALL | R | 0.00665 | O |
| 44 | Eudynamys scolopaceus (Linnaeus, 1758) | Asian Koel | S, M, PM, W | R | 0.00157 | F |
| ORDER 10: Falconiformes | | | | | |
| Family: Falconidae | | | | | |
| 45 | Falco tinunculus (Linnaeus, 1758) | Common Kestrel | W | R | 0.00005 | C |
| ORDER 11 : Galliformes | | | | | |
| Family: Phasianidae | | | | | |
| 46 | Francolinus pondicerianus (Gmelin, 1789) | Grey Francolin | S, PM, W | R | 0.00123 | G |
| ORDER 12 : Gruiformes | | | | | |
| Family: Railidae | | | | | |
| 47 | Amaurornis phoenicurus (Pennant, 1769) | White-breasted Waterhen | ALL | R | 0.00341 | O |
| 48 | Fulica atra (Linnaeus, 1758) | Common Coot | ALL | R | 0.00697 | O |
| 49 | Gallinula chloropus (Linnaeus, 1758) | Common Moorhen | ALL | R | 0.00521 | O |
| 50 | Porphyrio porphyrio (Linnaeus, 1758) | Purple Swamphen | ALL | R | 0.00875 | O |
| ORDER 13 : Passeriformes | | | | | |
| Family: Alaudidae | | | | | |
| 51 | Emberophila grisea (Scopoli, 1786) | Ashy-crowned Sparrow-lark | PM, WM | | 0.00026 | O |
| Family: Cisticolidae | | | | | |
| 52 | Orthotomus sutorius (Pennant, 1769) | Common Tailorbird | S, M, PM | R | 0.00225 | O |
| 53 | Prinia socialis (Sylvest, 1832) | Ashy Prinia | W | R | 0.00010 | O |
| 54 | Cisticola luctuosa (Raffles, 1810) | Zitting Cisticola | PM, W | R | 0.00118 | I |
| Family: Corvidae | | | | | |
| 55 | Corvus splendens (Vieillot, 1817) | House Crow | ALL | R | 0.02420 | O |
| Scientific name | Common name | Seasonal occurrence | Status | P_value | Feeding habit |
|-----------------|-------------|---------------------|--------|---------|---------------|
| 56 Dendrocitta vagabunda (Latham, 1790) | Rufous Treepie | ALL | R | 0.00797 | O |
| **Family: Dicruridae** | | | | | |
| 57 Dicrurus macrocerus (Niebull, 1817) | Black Drongo | ALL | R | 0.02608 | I |
| 58 Dicrurus aeneus (Niebull, 1817) | Bronzed Drongo | M | R | 0.00005 | I |
| **Family: Estrildidae** | | | | | |
| 59 Euodice malabarica (Linnaeus, 1758) | Indian Silverbill | ALL | R | 0.01814 | O |
| 60 Lonchura punctulata (Linnaeus, 1758) | Scaly-breasted Munia | ALL | R | 0.01473 | G |
| **Family: Hirundinidae** | | | | | |
| 61 Hirundo rustica (Linnaeus, 1758) | Barn Swallow | S, W | WM | 0.00133 | |
| 62 Pyronoprogne concolor (Sykes, 1832) | Dusky Crag Martin | W | WM | 0.00078 | |
| **Family: Laniidae** | | | | | |
| 63 Lanius cristatus (Linnaeus, 1758) | Brown Shrike | W | WM | 0.00005 | IV |
| 64 Lanius schach (Linnaeus, 1758) | Long-tailed Shrike | W | WM | 0.00013 | IV |
| 65 Turdoides striata (Dumont, 1823) | Jungle Babbler | ALL | R | 0.03807 | I |
| 66 Iduna caligata (Lichtenstein, 1823) | Booted Warbler | W | R | 0.00036 | I |
| 67 Acrocephalus stentoreus (Hemprich & Ehrenberg, 1833) | Clamorous Reed Warbler | PM, W | R | 0.00010 | I |
| **Family: Motacillidae** | | | | | |
| 68 Anthus rufulus (Niebull, 1818) | Paddyfield Pipit | ALL | R | 0.00642 | I |
| 69 Anthus hodgsoni (Richmond, 1907) | Olive-backed Pipit | PM, W | WM | 0.00097 | O |
| 70 Anthus trivialis (Linnaeus, 1758) | Tree Pipit | PM | | 0.00018 | O |
| 71 Motacilla alba (Linnaeus, 1758) | White Wagtail | ALL | WM | 0.00571 | C |
| 72 Motacilla cinerea (Tunstall, 1771) | Grey Wagtail | S, W | WM | 0.00149 | I |
| 73 Motacilla citreola (Pallas, 1776) | Citrine Wagtail | S, PM, W | WM | 0.00217 | C |
| 74 Motacilla flava (Linnaeus, 1758) | Yellow Wagtail | S, W | WM | 0.00212 | O |
| **Family: Muscicapidae** | | | | | |
| 75 Copsychus saularis (Linnaeus, 1758) | Oriental Magpie Robin | ALL | R | 0.00791 | I |
| 76 Ficedula albicilla (Pallas, 1811) | Taiga Flycatcher | W | WM | 0.00021 | I |
| 77 Saxicoloides fulicatus (Linnaeus, 1766) | Indian Robin | ALL | R | 0.00333 | O |
| 78 Saxicola mauro (Pallas, 1773) | Siberian Stonechat | W | WM | 0.00026 | I |
| 79 Phoenicurus ochruros (S.G. Gmelin, 1774) | Black Redstart | W | WM | 0.00002 | O |
| 80 Eumyias thalassinus (Swainson, 1838) | Verditer Flycatcher | W | WM | 0.00002 | O |
| 81 Luscinia svecica (Linnaeus, 1758) | Blue Throat | PM, W | WM | 0.00178 | O |
| **Family: Nectariniidae** | | | | | |
| 82 Cinnyris asiaticus (Latham, 1790) | Purple Sunbird | ALL | R | 0.00228 | N |
| 83 Leptocoma zeylonica (Linnaeus, 1766) | Purple-rumped Sunbird | ALL | R | 0.00333 | N |
| **Family: Oriolidae** | | | | | |
| 84 Oriolus kundoo (Sykes, 1832) | Indian Golden Oriole | ALL | R | 0.00440 | O |
| 85 Oriolus xanthornus (Linnaeus, 1758) | Black-hooded Oriole | ALL | R | 0.00506 | O |
| **Family: Passeridae** | | | | | |
| 86 Passer domesticus (Linnaeus, 1758) | House Sparrow | ALL | R | 0.00797 | G |
| 87 Gymnoris xanthocollis (Burton, 1838) | Chestnut Shouldered Petronia | PM | R | 0.00002 | H |
| **Family: Ploceidae** | | | | | |
| 88 Ploceus philippinus (Linnaeus, 1766) | Baya Weaver | ALL | R | 0.01324 | G |
| **Family: Pycnonotidae** | | | | | |
| 89 Pycnonotus cafer (Linnaeus, 1766) | Red-vented Bulbul | S, M, PM | R | 0.00749 | O |
| **Family: Phylliopodidae** | | | | | |
| 90 Phylloscopus trochiloides (Sundevall, 1837) | Greenish Warbler | S, M | WM | 0.00031 | IV |
| Scientific name | Common name | Seasonal occurrence* | Status* | P value* | Feeding habit$ |
|----------------|-------------|----------------------|---------|----------|-------------|
| **Family: Sturnidae** |
| 91 Acridotheres ginninious (Latham, 1790) | Bank Myna | ALL | R | 0.09439 | O |
| 92 Acridotheres tristis (Linnaeus, 1766) | Common Myna | ALL | R | 0.07866 | O |
| 93 Gracupica contra (Linnaeus, 1758) | Asian Pied Starling | ALL | R | 0.04719 | O |
| 94 Sturnia malabarica (Gimelin, 1789) | Chestnut-tailed Starling | ALL | R | 0.00749 | O |
| 95 Sturnia pagodarum (Gimelin, 1789) | Brahmny Starling | ALL | R | 0.00773 | O |
| **Family: Chloropseidae** |
| 96 Chloropsis jerdoni (Blyth, 1844) | Jordan’s Leafbird | PM, W | R | 0.00073 | O |
| **ORDER 14 : Pelecaniformes** |
| 97 Ardea alba (Linnaeus, 1758) | Great White Egret | ALL | R | 0.00086 | C |
| 98 Ardea intermedia (Wagler, 1827) | Intermediate Egret | S, W | R | 0.00010 | C |
| 99 Ardea purpurea (Linnaeus, 1766) | Purple Heron | S, PM, W | R | 0.00028 | C |
| 100 Anhinga rufa (Sey, 1832) | Indian Pond Heron | ALL | R | 0.01208 | C |
| 101 Bulbulus ibis (Linnaeus, 1758) | Cattle Egret | ALL | R | 0.00975 | C |
| 102 Egretta garzetta (Linnaeus, 1766) | Little Egret | ALL | R | 0.01491 | C |
| **ORDER 15 : Piciformes** |
| 103 Nycticorax nycticorax (Linnaeus, 1758) | Black-crowned Night Heron | ALL | R | 0.00576 | C |
| **ORDER 16 : Podicipediformes** |
| 104 Blue-winged Teal | Blue-winged Teal | ALL | R | 0.00086 | C |
| 105 Threskiornis melanophrus (Linnaeus, 1790) | Black-headed Ibis | ALL | WM | 0.00870 | I |
| **ORDER 17 : Psittaciformes** |
| 106 Dinopium benghalense (Linnaeus, 1758) | Black-rumped Flameback Woodpecker | ALL | R | 0.00099 | I |
| 107 Psilopogon haemacephalus (Statius Muller, 1776) | Coppersmith Barbet | S, PM, W | R | 0.00028 | C |
| **ORDER 18: Strigiformes** |
| 108 Athene brama (Temminck, 1821) | Spotted Owlet | ALL | R | 0.00361 | C |
| 109 Bubo bengalensis (Franklin, 1831) | Indian Eagle-owl | S | R | 0.00002 | C |
| 110 Tyto alba (Scopoli, 1769) | Barn Owl | ALL | R | 0.00152 | C |
| **ORDER 19: Suliformes** |
| 111 Phalusororocos carbo (Linnaeus, 1758) | Great Cormorant | S | R | 0.00002 | C |
| 112 Phalusororocos fuscicollis (Stephens, 1826) | Indian Cormorant | ALL | R | 0.01224 | C |

* PM—Pre Monsoon | M—Monsoon | W—Winter | S—Summer
* R—Resident | WM—Winter migrant | SM—Summer Migrant
* P value—species abundance/total abundance in the community
* O—Omnivorous | C—Carnivorous | I—Insectivorous | IV—Invertivorous | M—Molluscivorous | H—Herbivorous | G—Grainivorous | N—Nectarivorous | F—Frugivorous
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The resultant data reveals the functional roles and resource utilization patterns in the local ecosystem of the town. The availability of food resources is directly dependent on the precipitation rate and as an arid district of West Bengal, Purulia is severely deprived of water. Therefore, scarcity of water acts as a limiting factor for the survival of avian groups and a lesser number of granivores, herbivores, frugivores, and nectarivores throughout the year justifies the fact (Fig. 4). Interestingly, omnivores were highest in number followed by insectivores which might also be due to extreme weather conditions (Fig. 4). There are evidence about the influence of landscape on local species richness (Gaston 2000; Lawton 2000; Daube et al. 2003; Hossain & Aditya 2016).

As urbanization and developmental activities may destroy or degrade the natural habitats of birds therefore, there are urgent needs for the conservation of local habitats, including wetlands and water bodies.

Successful conservation of birds would require continuous monitoring by government authorities and awareness among local people.

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Image 1–60. Birds photographed during the study: 1—Accipiter badius | 2—Milvus migrans | 3—Pernis ptilorhynchus | 4—Circus aeruginosus | 5—Dendrocygna javanica | 6—Netta rufina | 7—Nettapus coromandelianus | 8—Anas clypeata | 9—Spatula querquedula | 10—Mareca penelope | 11—Anas acuta | 12—Mareca strepera | 13—Aythya nyroca | 14—Gysphyrus balasiensis | 15—Apus affinis | 16—Upupa epops | 17—Ocyeros birostris | 18—Charadrius dubius | 19—Vanellus indicus | 20—Vanellus malabaricus | 21—Hydrophasianus chirurgus | 22—Metopidius indicus | 23—Actitis hypoleucos | 24—Gallinago gallinago | 25—Calidris temminckii | 26—Gelochelidon nilotica | 27—Anastomus oscitans | 28—Leptoptilos javanicus | 29—Columba livia | 30—Spilopelia chinensis | 31—Streptopelia decaocto | 32—Streptopelia tranquebarica | 33—Treron phoenicopterus | 34—Alcedo atthis | 35—Ceryle rudis | 36—Halcyon smyrnensis | 37—Coracias benghalensis | 38—Merops orientalis | 39—Coracina macell | 40—Centropus sinensis | 41—Centropus bengalensis | 42—Clamator jacobinus | 43—Hierococcyx varius | 44—Eudynamys scolopaceus | 45—Falco tinnunculus | 46—Francolinus pondicerianus | 47—Amaurornis phoenicus | 48—Fulica atra | 49—Gallinula chloropus | 50—Porphyrio porphyrio | 51—Eremopterix griseus | 52—Orthotomus sutorius | 53—Prinia socialis | 54—Cisticola juncidis | 55—Corvus splendens | 56—Dendrocitta vagabunda | 57—Dicrurus macrocercus | 58—Dicrurus aeneus | 59—Euodice malabarica | 60—Lonchura punctulata | All photographs © Swastik Mahato.
Image 61–115. Birds photographed during the study: 61—Hirundo rustica | 62—Ptyonoprogne concolor | 63—Lanius cristatus | 64—Lanius schach | 65—Turdoides striata | 66—Iduna calcigata | 67—Acrocephalus stentoreus | 68—Anthus rufulus | 69—Anthus hodgsoni | 70—Anthus trivialis | 71—Motacilla alba | 72—Motacilla cinerea | 73—Motacilla citreola | 74—Motacilla flava | 75—Copsychus saularis | 76—Ficedula albicilla | 77—Saxicoloides fulicatus | 78—Saxicola maurus | 79—Phoenicurus ochruros | 80—Eumyias thalassinus | 81—Luscinia svecica | 82—Cinnyris asiaticus | 83—Leptocoma zeylonica | 84—Oriolus kundoo | 85—Oriolus xanthornus | 86—Passer domesticus | 87—Gymnoris xanthocollis | 88—Ploceus philippinus | 89—Pycnonotus cafer | 90—Phylloscopus trochiloides | 91—Acridotheres ginnianus | 92—Acridotheres tristis | 93—Gracupica contra | 94—Sturnia malabarica | 95—Sturnia pagodarum | 96—Chloropsis jerdoni | 97—Ardea alba | 98—Ardea intermedia | 99—Ardea purpurea | 100—Ardea lagravi | 101—Bubulcus ibis | 102—Egretta garzetta | 103—Nycticorax nycticorax | 104—Pseudibis papillosa | 105—Threskiornis melanocephalus | 106—Dinopium benghalense | 107—Pilopogon haemacephalus | 108—Tachybaptus ruficollis | 109—Psittacula eupatria | 110—Psittacula krameri | 111—Athena brama | 112—Bubo bengalensis | 113—Tyto alba | 114—Phalacrocorax carbo | 115—Phalacrocorax fuscicolis | All photographs © Swastik Mahato.
Decline of White-throated Bushchat Saxicola insignis Gray J.E. & J.R. Gray, 1847 (Aves: Passeriformes: Muscicapidae) in Nepal: implications on its global status

Yadav, Laxman Prasad Poudyal, Hathan Chaudhary, Pradeep Raj Joshi, Carol Inskipp & Hem Sagar Baral, Tek Raj Bhatt, Bed Kumar Dhakal, Dhiraj Chaudhary, Hemanta Kumar Yadav, Laeman Prasad Poudyal, Hathan Chaudhary, Pradeep Raj Joshi, Carol Inskipp & Rajan Amin, Pp. 17847–17855

Relocation of a GPS-collared conflict Sloth Bear Melursus ursinus (Mammalia: Carnivora) in Karnataka, Indiﬀat

– Attur Shanmugam Arun, Shanmugavelu Swaminathan, Yogaraj Pannerselvam, Thomas Robert Sharp, Sydney Rae Stephens, Kartick Satyanarayan & Geeta Seshamani, Pp. 17856–17864

First conﬁrmed sightings of Blue Whales Balaenoptera musculus Linnaeus, 1758 (Mammalia: Cetartiodactyla: Balaenidae) in the Philippines since the 19th century – Jo Marie Vera Acebes, Joshua Neal Silberg, Timothy John Gardner, Edna Rex Sabater, Jo Marie Vera Acebes, Angelico Jose Cavada Tiongson, Patricia Dunleavy, Pp. 17865–17874

First conﬁrmed sightings of Blue Whales Balaenoptera musculus Linnaeus, 1758 (Mammalia: Cetartiodactyla: Balaenidae) in the Philippines since the 19th century – Jo Marie Vera Acebes, Joshua Neal Silberg, Timothy John Gardner, Edna Rex Sabater, Angelico Jose Cavada Tiongson, Patricia Dunleavy, Pp. 17865–17874

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Sordacostus vijayakumari (Coleoptera: Dytiscidae), a new aquatic beetle species from landslide hit area of Nelliampathy Forest Range, Western Ghats, Kerala, India – P.P. Anand, P.P. Ashiq, M. Smitha, M. Adhithya, T. Tabin & V. Suresh, Pp. 17999–18003

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Addition of four woodland species (Crustacea: Isopoda) to the checklist of Iranian Oniscidea – Zayer Bakhshe, Saber Sadeghi, Hamid Davarshnia & Meysam Dashan, Pp. 18015–18019

Catalogue of selected insect groups of Lalwan Community Reserve and Ranjit Saggar Conservation Reserve, Punjab, India – A. Venkatesh, N. Sridharan, S. Agnes Jeya Packiavathi & K. Muthamish Selvan, Pp. 17984–18004

Potential phytophagous insects of Pteridium revolutionum (Blume) Nakai, an invasive fern – M.S. Arjun & S. Gopakumar, Pp. 18030–18034

Notes

Freshwater medusae Limnocnida indica Annandale, 1911 in the Cauvery Wildlife Sanctuary, Dubare Reserve Forest and Shivanasamudram in Karnataka, India, with a commentary note on the exotic Craspedacusta sowerbii Lebour, 1880 – K. Muthamish Selvan, Pp. 18035–18038

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