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Residential, IUCN and WPA Status of the Avian Fauna Observed in Indore city (M.P.), India

Priya Gaur*, Mohnish Pichhode*, Jatan Dudwe*, C.S. Shrivastava and S. Gaherwal*†**

*Department of Zoology, Government Holkar (Model, Autonomous) Science College, Indore, M.P., India

**Department of Zoology, Government College, Mundi, Khandwa, M.P., India

†Corresponding author: S. Gaherwal; psgaherwal@yahoo.com

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ABSTRACT

The objective of the present study was to prepare a record of the Residential, IUCN and WPA status of the birds recorded in four sites of Indore city. The study was of one-year duration (2018). The results showed that there were five species as winter migrants, one as summer migrant, six as local migrants, and 46 as resident species. Only one species, i.e. *Psittacula eupatria* was found to be in the near threatened category. According to WPA status, 5 species were Schedule I species, 1 schedule V, and 52 species as schedule IV species. These sites have a potential of augmentation of avian fauna shortly and these spaces abide by many species with a larger diversity than estimated. The present study is the first-ever record of avian species in the three sites of Indore city. The results of this study support the scope of conservation of these spaces for increasing the number of species shortly.

INTRODUCTION

Due to rich vegetation and well-protected areas, recreational man-made parks have succeeded in attracting good avifauna. These areas with its rich flora supported a rich and varied avifauna. Adaptation of birds depends upon their body mass and feeding habits, because of which they have followed human colonization. Although not all birds can thrive in urbanized habitat, some have been able to adapt and survive in artificial habitats. Some of the most common and familiar birds seen in our cities or villages are Red-vented Bulbul, House Crow, Blue-rock Pigeon, Common Myna, Rose-ringed Parakeet and House Sparrow (Seress & Liker 2015). Green spaces in cities have been formally identified as areas with notable avian biodiversity. However, the urban environment is not appraised areas with conservation importance (Vallejo et al. 2009). Due to the increase in population, the interaction between human and ecosystem is expanding. Due to alarming interference, avian diversity is in danger because of a few more reasons; for example, development of the residential area and urbanized colonies. Factors like green space dimension and the number of trees are responsible for the number of avian species present in an area. The structural heterogeneity of trees inside the study area is a crucial aspect supporting high levels of species abundance (Sharma & Shukla 2015).

Birds due to their sensitivity to the environmental perturbations, relevance to ecosystem functioning; example seed dispersal and pollination; and their relative ease in sampling, they are well known as Indicator taxa. Similarly, bird diversity and abundance are different in different vegetation types and dependent primarily on plant community diversity and vegetation structure (Sharma & Shukla 2015). Because of this reason, they are used to monitor the quality of any habitat or niche and hence they are the key elements of any ecosystem (Mariappan et al. 2013). They play an important role in any ecosystem as they are potential bio-indicators, pollinators, seed dispersers and scavengers, and beneficial to humans in agriculture by checking the population of harmful pests (Dhindsa & Saini 1994). The numbers of migratory birds visiting any area also indicate the health of that particular environment (Panwar & Salunkhe 2014). Hence, the present study aimed to estimate the residential, IUCN and WPA status of the avian fauna in the selected sites of Indore city.

MATERIALS AND METHODS

Study area: Four sites were selected from Indore city according to their construction and maintenance. Site 1: Meghdoot Garden; Site 2: Nehru Park; Site 3: Lalbagh; Site 4: Pipliyapala Regional Park.

Study period: One year, i.e. January to December 2018.

After preparing a checklist of avian fauna at all the sites, these birds were categorized according to Table 1 (Datta 2016).

Table 1: Resident and migratory status of the birds.

S. No.	Category	Residential Status	Abbreviation
1	Breeding in the same place and are non-migratory.	Resident	R
2	Winter migratory birds	Winter Migrant	WM
3	Summer visitors	Summer Migrant	SM
4	Species found irregularly but are resident in the State (M.P.).	Local Migrant	LM

Initially, a checklist of the avian fauna was prepared (Gaur et al. 2019); then all the species were categorised according to the Birdlife international (mentioned in Data zones). Their IUCN status was mentioned along with their Wildlife Protection Act (1972) categories.

RESULTS

In Site 1, out of 39 species recorded 35 species were resident species (90%); two species were winter migratory birds (5%) (*Hirundo rustica* and *Phylloscopus trochiloides)* and two were local migrating species (5%) (*Rhipidura albicollis* and *Terpsiphone paradisi*), which were resident to the state of Madhya Pradesh. Similarly, in Site 2, total 34 species were observed in all the four seasons collectively, out of which 30 resident species were noted; two were winter migratory species (6%) (*Ficedula parva* and *Saxiocola maurus)* and two were local migrating species (6%) (*Rhipidura albicollis* and *Leptocoma zeylonica)* belonging to resident species. In Site 3, we recorded 41 species of avian fauna; there were two winter migratory species (5%) (*Hirundo rustica* and *Ficedula parva*) and two local migratory species (5%) (*Prinia socialis* and *Oenanthe fusca*) in this study site, there were 37 resident species (90%) of avian fauna. Interestingly, there were 58 species of birds in Site 4 which is highest in this study. Out of these, 46 species were resident species (79%); five species were winter migratory (9%) (*Ficedula parva, Saxicola maurus, Phylloscopus trochiloides, Hirundo rustica* and *Motacilla alba)*; one species was summer migratory (2%) (*Clamator jacobinus*) and the six were local migratory avian species (10%) (*Oenanthe fusca, Pavo cristatus, Rhipidura albicollis, Terpsiphone paradisi, Leptocoma zeylonica* and *Prinia socialis).*

From Tables 2-5 and Figs. 1-4, we can conclude that the highest number (46) of resident birds were recorded in Site 4 and the lowest count (30) was observed in Site 2. The highest number of winter migratory species (5) was recorded in Site 4. Similarly, local migratory species were highest (6) in Site 4.

The data (Tables 2-5) depicts the species recorded at Site 1, Site 2, Site 3 and Site 4 in 2018. Their IUCN status and WPA Schedule have been mentioned. In Site 1, 38

Table 2: IUCN status and WPA schedule of the recorded avian fauna at Site 1 in 2018.

Order	Species	R/WM/SM/LM	IUCN Status	WPA
Columbiformes	*Columba livia*	R	LC	Schedule-IV
	Streptopelia chinensis	R	LC	Schedule-IV
	Streptopelia senegalensis	R	LC	Schedule-IV
Cuculiformes	*Centropus sinensis*	R	LC	Schedule-IV
	Eudynamys scolopaceus	R	LC	Schedule-IV
Pelecaniformes	*Bubulcus ibis*	R	LC	Schedule-IV
Charadriiformes	*Vanellus indicus*	R	LC	Schedule-IV
Accipitriformes	*Accipiter badius*	R	LC	Schedule-I
	Milvus migrans	R	LC	Schedule-I
Strigiformes	*Athene brama*	R	LC	Schedule-IV
Bucerotiformes	*Ocyceros birostris*	R	LC	Schedule-IV
Piciformes	*Psilopogon haemacephalus*	R	LC	Schedule-IV
Coraciiformes	*Merops orientalis*	R	LC	Schedule-IV
	Halcyon smyrnensis	R	LC	Schedule-IV
Psittaciformes	*Psittacula eupatria*	R	NT	Schedule-IV
	Psittacula krameri	R	LC	Schedule-IV

Table Cont....

Order	Species	R/WM/SM/LM	IUCN Status	WPA
Passeriformes	*Pericrocotus cinnamomeus*	R	LC	Schedule-IV
	Aegithina tiphia	R	LC	Schedule-IV
	Dicrurus macrocercus	R	LC	Schedule-IV
	Rhipidura albicollis	R/LM	LC	Schedule-IV
	Dendrocitta vagabunda	R	LC	Schedule-IV
	Corvus splendens	R	LC	Schedule-V
	Terpsiphone paradisi	R/LM	LC	Schedule-IV
	Dicaeum agile	R	LC	Schedule-IV
	Cinnyris asiaticus	R	LC	Schedule-IV
Passeriformes	*Euodice malabarica*	R	LC	Schedule-IV
	Passer domesticus	R	LC	Schedule-IV
	Machlolophus xanthogenys	R	LC	Schedule-IV
	Orthotomus sutorius	R	LC	Schedule-IV
	Hirundo rustica	WM	LC	Schedule-IV
	Ptyonoprogne concolor	R	LC	Schedule-IV
	Pycnonotus cafer	R	LC	Schedule-IV
	Phylloscopus trochiloides	WM	LC	Schedule-IV
	Zosterops palpebrosus	R	LC	Schedule-IV
	Turdoides striata	R	LC	Schedule-IV
	Gracupica contra	R	LC	Schedule-IV
	Acridotheres tristis	R	LC	Schedule-IV
	Saxicoloides fulicatus	R	LC	Schedule-IV
	Copsychus saularis	R	LC	Schedule-IV

(R = Resident; WM = Winter Migrant; SM = Summer Migrant; LM = Local Migrant; LC = Least Concern & NT = Near Threatened)

Table 3: IUCN status and WPA schedule of the recorded avian fauna at Site 2 in 2018.

Order	Species	R/WM/SM/LM	IUCN STATUS	WPA Schedule
Columbiformes	*Columba livia*	R	LC	Schedule-IV
	Streptopelia chinensis	R	LC	Schedule-IV
	Streptopelia senegalensis	R	LC	Schedule-IV
Caprimulgiformes	*Apus affinis*	R	LC	Schedule-IV
Cuculiformes	*Eudynamys scolopaceus*	R	LC	Schedule-IV
Pelecaniformes	*Bubulcus ibis*	R	LC	Schedule-IV
Charadriiformes	*Vanellus indicus*	R	LC	Schedule-IV
Accipitriformes	*Accipiter badius*	R	LC	Schedule-I
	Milvus migrans	R	LC	Schedule-I
Strigiformes	*Athene brama*	R	LC	Schedule-IV
Bucerotiformes	*Ocyceros birostris*	R	LC	Schedule-IV
Piciformes	*Psilopogon haemacephalus*	R	LC	Schedule-IV
Coraciiformes	*Merops orientalis*	R	LC	Schedule-IV
	Halcyon smyrnensis	R	LC	Schedule-IV
Psittaciformes	*Psittacula krameri*	R	LC	Schedule-IV

Table Cont....

Order	Species	R/WM/SM/LM	IUCN STATUS	WPA Schedule
Passeriformes	*Oriolus kundoo*	R	LC	Schedule-IV
	Aegithina tiphia	R	LC	Schedule-IV
	Dicrurus macrocercus	R	LC	Schedule-IV
	Rhipidura albicollis	R/LM	LC	Schedule-IV
	Dendrocitta vagabunda	R	LC	Schedule-IV
	Corvus splendens	R	LC	Schedule-V
	Corvus macrorhynchos	R	LC	Schedule-IV
	Dicaeum agile	R	LC	Schedule-IV
	Leptocoma zeylonica	R/LM	LC	Schedule-IV
	Passer domesticus	R	LC	Schedule-IV
	Orthotomus sutorius	R	LC	Schedule-IV
	Ptyonoprogne concolor	R	LC	Schedule-IV
	Pycnonotus cafer	R	LC	Schedule-IV
	Turdoides striata	R	LC	Schedule-IV
	Acridotheres tristis	R	LC	Schedule-IV
	Saxicoloides fulicatus	R	LC	Schedule-IV
	Copsychus saularis	R	LC	Schedule-IV
	Ficedula parva	WM	LC	Schedule-IV
	Saxicola maurus	WM	LC	Schedule-IV

(R = Resident; WM = Winter Migrant; SM = Summer Migrant; LM = Local Migrant; LC = Least Concern & NT = Near Threatened)

Table 4: IUCN status and WPA schedule of the recorded avian fauna at Site 3 in 2018.

Order	Species	R/WM/SM/LM	IUCN STATUS	WPA Schedule
Columbiformes	*Columba livia*	R	LC	Schedule-IV
	Streptopelia chinensis	R	LC	Schedule-IV
	Streptopelia senegalensis	R	LC	Schedule-IV
Caprimulgiformes	*Apus affinis*	R	LC	Schedule-IV
Cuculiformes	*Centropus sinensis*	R	LC	Schedule-IV
	Eudynamys scolopaceus	R	LC	Schedule-IV
Charadriiformes	*Vanellus indicus*	R	LC	Schedule-IV
Accipitriformes	*Elanus caeruleus*	R	LC	Schedule-I
	Milvus migrans	R	LC	Schedule-I
Strigiformes	*Athene brama*	R	LC	Schedule-IV
Bucerotiformes	*Ocyceros birostris*	R	LC	Schedule-IV
Piciformes	*Psilopogon haemacephalus*	R	LC	Schedule-IV
Coraciiformes	*Merops orientalis*	R	LC	Schedule-IV
	Halcyon smyrnensis	R	LC	Schedule-IV
Psittaciformes	*Psittacula krameri*	R	LC	Schedule-IV
Passeriformes	*Pericrocotus cinnamomeus*	R	LC	Schedule-IV
	Coracina javensis	R	LC	Schedule-IV
	Oriolus kundoo	R	LC	Schedule-IV
	Aegithina tiphia	R	LC	Schedule-IV
	Dicrurus macrocercus	R	LC	Schedule-IV
	Dendrocitta vagabunda	R	LC	Schedule-IV

Table Cont....

Order	Species	R/WM/SM/LM	IUCN STATUS	WPA Schedule
	Corvus splendens	R	LC	Schedule-V
	Corvus macrorhynchos	R	LC	Schedule-IV
	Cinnyris asiaticus	R	LC	Schedule-IV
	Euodice malabarica	R	LC	Schedule-IV
	Passer domesticus	R	LC	Schedule-IV
	Motacilla maderaspatensis	R	LC	Schedule-IV
	Prinia socialis	R/LM	LC	Schedule-IV
	Orthotomus sutorius	R	LC	Schedule-IV
	Hirundo smithii	R	LC	Schedule-IV
	Hirundo rustica	WM	LC	Schedule-IV
	Pycnonotus cafer	R	LC	Schedule-IV
	Zosterops palpebrosus	R	LC	Schedule-IV
	Turdoides striata	R	LC	Schedule-IV
	Gracupica contra	R	LC	Schedule-IV
	Acridotheres tristis	R	LC	Schedule-IV
	Saxicoloides fulicatus	R	LC	Schedule-IV
	Copsychus saularis	R	LC	Schedule-IV
	Cyornis tickelliae	R	LC	Schedule-IV
	Ficedula parva	WM	LC	Schedule-IV
	Oenanthe fusca	R/LM	LC	Schedule-IV

(R = Resident; WM = Winter Migrant; SM = Summer Migrant; LM = Local Migrant; LC = Least Concern & NT = Near Threatened)

Table 5: IUCN status and WPA schedule of the recorded avian fauna at Site 4 in 2018.

Order	Species	R/WM/SM/LM	IUCN STATUS	WPA Schedule
Galliformes	*Pavo cristatus*	LM	LC	Schedule-I
Columbiformes	*Columba livia*	R	LC	Schedule-IV
	Streptopelia chinensis	R	LC	Schedule-IV
	Streptopelia senegalensis	R	LC	Schedule-IV
Caprimulgiformes	*Apus affinis*	R	LC	Schedule-IV
Cuculiformes	*Centropus sinensis*	R	LC	Schedule-IV
	Clamator jacobinus	SM	LC	Schedule-IV
	Eudynamys scolopaceus	R	LC	Schedule-IV
Pelecaniformes	*Ardeola grayii*	R	LC	Schedule-IV
	Bubulcus ibis	R	LC	Schedule-IV
Charadriiformes	*Vanellus indicus*	R	LC	Schedule-IV
Accipitriformes	*Elanus caeruleus*	R	LC	Schedule-I
	Pernis ptilorhynchus	R	LC	Schedule-I
	Accipiter badius	R	LC	Schedule-I
	Milvus migrans	R	LC	Schedule-I
Strigiformes	*Athene brama*	R	LC	Schedule-IV
Bucerotiformes	*Ocyceros birostris*	R	LC	Schedule-IV
Piciformes	*Psilopogon haemacephalus*	R	LC	Schedule-IV

Table Cont....

Order	Species	R/WM/SM/LM	IUCN STATUS	WPA Schedule
Coraciiformes	*Merops orientalis*	R	LC	Schedule-IV
	Halcyon smyrnensis	R	LC	Schedule-IV
Psittaciformes	*Psittacula cyanocephala*	R	LC	Schedule-IV
	Psittacula eupatria	R	NT	Schedule-IV
	Psittacula krameri	R	LC	Schedule-IV
Passeriformes	*Pericrocotus cinnamomeus*	R	LC	Schedule-IV
	Coracina javensis	R	LC	Schedule-IV
	Oriolus kundoo	R	LC	Schedule-IV
	Aegithina tiphia	R	LC	Schedule-IV
	Dicrurus macrocercus	R	LC	Schedule-IV
	Rhipidura albicollis	R/LM	LC	Schedule-IV
	Dendrocitta vagabunda	R	LC	Schedule-IV
	Corvus splendens	R	LC	Schedule-V
	Corvus macrorhynchos	R	LC	Schedule-IV
	Terpsiphone paradisi	R/LM	LC	Schedule-IV
	Dicaeum agile	R	LC	Schedule-IV
	Leptocoma zeylonica	R/LM	LC	Schedule-IV
	Cinnyris asiaticus	R	LC	Schedule-IV
	Eurydice malabarica	R	LC	Schedule-IV
	Passer domesticus	R	LC	Schedule-IV
	Motacilla maderaspatensis	R	LC	Schedule-IV
	Motacilla alba	WM	LC	Schedule-IV
	Machlolophus xanthogenys	R	LC	Schedule-IV
	Prinia socialis	R/LM	LC	Schedule-IV
	Orthotomus sutorius	R	LC	Schedule-IV
	Hirundo smithii	R	LC	Schedule-IV
	Hirundo rustica	WM	LC	Schedule-IV
	Ptyonoprogne concolor	R	LC	Schedule-IV
	Pycnonotus cafer	R	LC	Schedule-IV
	Phylloscopus trochiloides	WM	LC	Schedule-IV
	Zosterops palpebrosus	R	LC	Schedule-IV
	Turdoides striata	R	LC	Schedule-IV
	Gracupica contra	R	LC	Schedule-IV
	Acridotheres tristis	R	LC	Schedule-IV
	Saxicoloides fulicatus	R	LC	Schedule-IV
	Copsychus saularis	R	LC	Schedule-IV
	Cyornis tickelliae	R	LC	Schedule-IV
	Ficedula parva	WM	LC	Schedule-IV
	Saxicola maurus	WM	LC	Schedule-IV
	Oenanthe fusca	R/LM	LC	Schedule-IV

(R = Resident; WM = Winter Migrant; SM = Summer Migrant; LM = Local Migrant; LC = Least Concern & NT = Near Threatened)

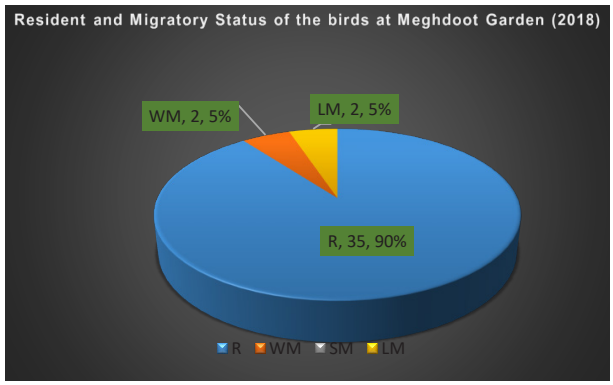


Fig. 1: Percentage composition of R/SM/WM/LM avian fauna at Site 1.

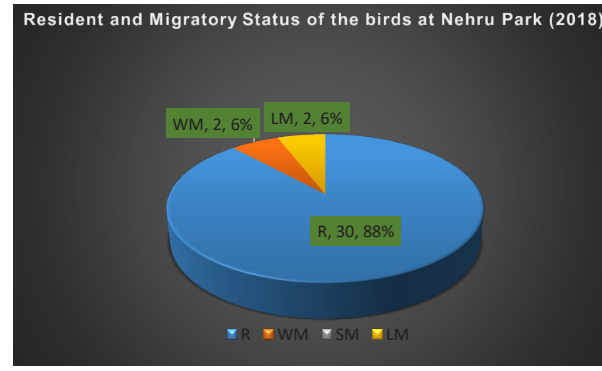


Fig. 2: Percentage composition of R/SM/WM/LM avian fauna at Site-2.

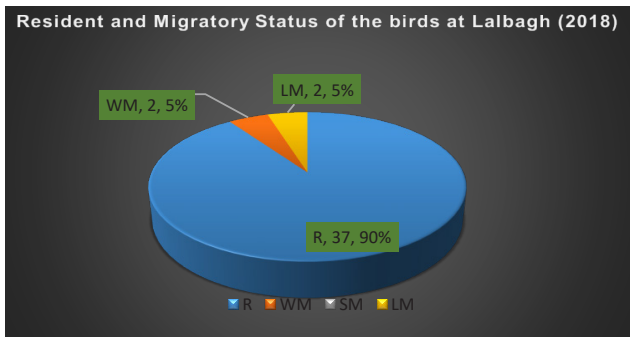
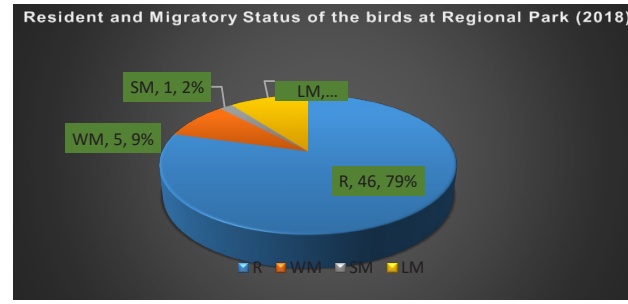


Fig. 3: Percentage composition of R/SM/WM/LM avian fauna at Site-3.



(Legends - R = Resident; WM = Winter Migrant; SM = Summer Migrant; LM = Local Migrant)

Fig. 4: Percentage composition of R/SM/WM/LM avian fauna at Site-4.

species belonged to the Least Concern category and only one species (*Psittacula eupatria*) is in the Near Threatened category (*Psittacula eupatria*). Similarly, in Site2, all the 34 species belonged to the Least Concern category. In Site 3, 41 species were recorded and interestingly, all belonged to the Least Concern category. Lastly, there is only one species (*Psittacula eupatria*) in the Near Threatened category in Site 4 and the remaining 57 species belonged to the Least Concern category.

According to Wildlife Protection Act, 1972, the results (Figs. 5-8) showed that in Site-1 there are two species (*Accipiter badius and Milvus migrans*) in schedule I; one species (*Corvus splendens*) in Schedule V and 36 species in Schedule IV. Moreover, in Site-2, there are two species (*Accipiter badius and Milvus migrans*) in schedule I, one species (*Corvus splendens)* in Schedule V, and 31 species in Schedule IV. Furthermore, in Site-3, there are two species (*Accipiter badius and Milvus migrans*) in schedule

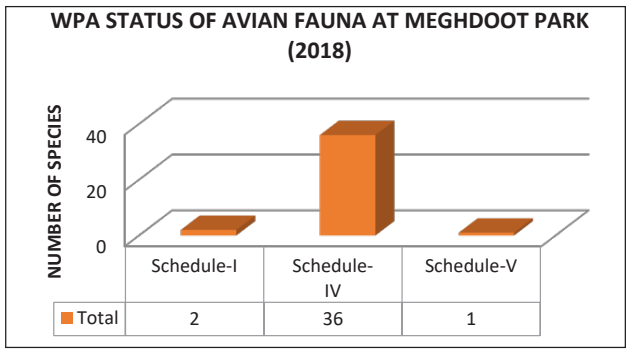


Fig. 5: WPA schedule of the recorded avian fauna at Site-1 in 2018.

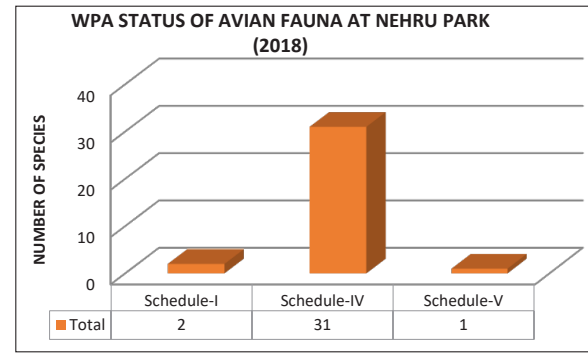


Fig. 6: WPA schedule of the recorded avian fauna at Site-2 in 2018.

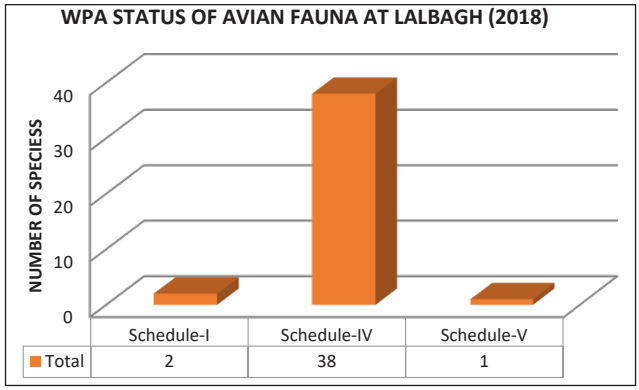


Fig. 7: WPA schedule of the recorded avian fauna at Site-3in 2018.

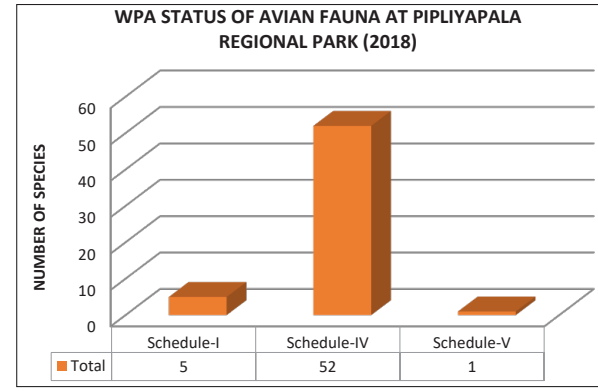


Fig. 8: WPA schedule of the recorded avian fauna at Site-4 in 2018.

Fig. 9: Some photographs of the recorded species.

I; one species (*Corvus splendens)* in Schedule V and 38 species in Schedule IV. In addition to this, at Site-4 there are five species (*Pavo cristatus, Elanus caeruleus, Pernis ptilorhynchus, Accipiter badius* and *Milvus migrans*) are in Schedule I; one species (*Corvus splendens*) in Schedule V, and 52 species in Schedule IV. Fig. 9 shows some photographs of the recorded species.

DISCUSSION

We have reported the IUCN status for various greenspaces of Indore city. This is the first-ever record for such parameters. Interestingly, Khah & Wani (2012) used a similar methodology and concluded that several species were breeding residents in their area; which is quite similar in our study. These species include Jungle crow and Stone chat. Ramesh et al. (2011) reported 129 species in Kuno wildlife sanctuary and found that 97 species were residents; 25 winter migrants; 4 summer migrants; and 6 local migrating species of Central India. 73 species were observed by Arya et al. (2013) in Shivpuri district. Out of which 25 species were residential; 29 resident migrants and 38 winter migrating species. This study is quite corroborating with our study.

Similarly, analyses of residential status of avian species (Central India) done by Kumar & Kanaujia (2015), revealed that 32 species were winter visitors; 24 species residential, 16 were residential/local migratory and three local migratory. Similar observations were recorded by Kumar et al. (2015) in their preliminary study at Nawabganj Bird Sanctuary. They reported six species of Near Threatened category in their study period, in which Alexandrine parakeet was also mentioned. Parveen & Llyas (2019) also conducted a preliminary survey of birds in Pench Tiger reserve and found

seven species in Near Threatened category and 208 species belonged to Least Concern Category. Adhikari et al. (2019) studied the factors affecting diversity and distribution of birds of IUCN Red List. They also have marked seven species of Near Threatened category including Alexandrine parakeet which resembles our study results.

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REFERENCES

Adhikari, J.N., Bhattaraj, B.P. and Thapa, T.B. 2019. Factors affecting diversity and distribution of threatened birds in Chitwan National Park, Nepal. Journal of Threatened Taxa, 11(5): 13511-13522.

Arya, M., Rao, R.J. and Mishra, A.K. 2014. Avifaunal occurrence and distribution of wetland birds in Sakhya Sagar and Madhav lakes in Madhav National Park, Shivpuri, India. Journal of Environmental Biology, 35(4): 703-708.

Datta, M. 2016. Status, guild and diversity of avian fauna from a wetland site and surroundings, in Krishnagar, a city beside tropic of cancer, West Bengal, India. Int. J. of Fauna and Biological Studies, 3(4): 68-75.

Dhindsa, M.S. and Saini, H.K. 1994. Agricultural ornithology: An Indian perspective. J. Biosciences, 19: 391-402.

Gaur, P., Shrivastava, C. S. and Gaherwal, S. 2019. Spatial variation in avifaunal diversity from various green spaces of Indore city, Madhya Pradesh. International Journal of Current Research and Reviews, 11(14): 06-15.

Khah, S., Rao, R. and Wani, K. 2012. Studies on bird diversity of Overa-Aru Wildlife Sanctuary of Jammu and Kashmir, India. Journal of Threatened Taxa, 4(13): 3228-3232. https://doi.org/10.11609/JoTT.o2899.3228-32.

Kumar, A. and Kanaujia, A. 2015. Waterbird diversity of Samaspur Bird Sanctuary, Rae Bareli, District, Uttar Pradesh. Discovery Nature, 9(23): 48-57.

Kumar, A., Kanaujia, A., Kushwaha, S. and Kumar, A. 2015. A Preliminary assessment of avifaunal diversity of Nawabganj Bird Sanctuary, Unnao, Uttar Pradesh. IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT), 9(4): 81-91.

Mariappan, N., Ahmed Khalfan, B.K. and Krishnakumar, S. 2013. Assessment of bird population in different habitats of agricultural ecosystem. International Journal of Scientific Research in Environmental Sciences (IJSRES), 1(11): 306-316.

Panwar, S.K. and Salunkhe, P.S. 2014. Study of migratory birds in and around Pandharpur city with special reference to Takali (Padmavati) lake, Pandharpur, Dist. Solapur (M.S.). Avishkar-Solapur University Journal, 3: 38-44.

Parveen, T. and Llyas, O. 2019. A preliminary survey of birds in Pench Tiger Reserve, Madhya Pradesh, India. Asian Journal of Environment & Ecology, 9(1): 1-20.

Ramesh, T., Sridharan, N. and Kalle, R. 2011. Birds of Kuno Wildlife Sanctuary, Central India. Zoos print., XXVI (12): 25-29.

Seress, G. and Liker, A. 2015. Habitat urbanization and its effects on birds. Acta Zoologica Academiae Scientiarum Hungaricae, 61(4): 373-408.

Sharma, S. and Shukla, A. 2015. Preliminary study on avian faunal diversity of Polipathar area in Jabalpur (M.P.). International Journal of Current Advanced Research, 4(9): 364-367.

Vallejo, B.M., Aloy, A.B. and Ong, P.S. 2009. The distribution, abundance and diversity of birds in Manila's last greenspaces. Landscape and Urban Planning, 89(3-4): 75-85.