

Urban Avifaunal Biodiversity in context of Udaipur, Rajasthan, India

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ABSTRACT

The beginning of the 21st century can be characterized by tremendous growth of urban areas and associated process of globalization and unification of urban environments. Urban environment as new ecosystems is of great interest all over the world. Urban ecosystems are complex social-ecological systems with important functions. These man-made ecosystems have certain areas with high biological diversity, including both remnant species and species purposefully or unintentionally introduced by human actions. There can be important habitats and valuable corridors for both common and less common species within the urban sprawl.

As per our preliminary studies in the urban areas of southern parts of Rajasthan, local people were interested in local biodiversity, especially on phenological events, and benefited from it by getting aesthetic pleasure, and information on seasonal changes. The cities such as Udaipur have the artificially developed diversified habitat within the urban limits which provide shelter and protection to many floral and faunal species. Urban areas are rich in species particularly vascular plants and many groups of animals especially birds. The artificially managed parks such as Sajjan Niwas have the diversity of flora whereas artificial lakes are the sites of great wetland avifauna. The diversity of avifauna is taken for identifying the importance of biodiversity for Udaipur which is among the top ten tourism sites of world. The role of urban areas in functions such as provision of ecosystem services will largely be determined by patterns of biodiversity within that area.

This paper aims to respond to the call for integrative research by studying relationships between the anthropogenic activities and urban biodiversity of the cities from the southern part of Rajasthan.

To support an integrative approach in urban green planning, both ecological and social research has to be incorporated to the planning process.

Key Words: urban, avifauna, conservation, Udaipur, Rajasthan

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INTRODUCTION

Worldwide, urban areas are expanding both in size and number. Rapid urbanization is expected to continue. The beginning of the 21st century can be characterised by tremendous growth of urban areas and associated process of globalisation and unification of urban environments. Although cities occupy just 2% of the Earth's surface, their inhabitants use 75% of the planet's natural resources (UNEP 2008). As a result of urban expansion, native vegetation is reduced and fragmented over a landscape mosaic in which both the amount of impervious surface is increased, and the structure and composition of the remaining vegetation is progressively altered (Beissinger and Osborne 1982, Arnold and Gibbons 1996, Vitousek *et al.* 1997, Germain *et al.* 1998, Marzluff *et al.* 1998). Urbanization—the increase in the urban share of total population—is inevitable, but it can also be positive. Despite the significant destruction and degradation of habitats, urban areas have the capacity to support a wide diversity of vertebrate and invertebrate fauna species, perhaps due to the range of diverse natural and artificial habitat niches and conditions that occur in urban areas (Niemelä 1999a,b, Collins *et al.* 2000). Green spaces in form of parks, reserves, private gardens, wetland, lakes etc. in the urban areas contribute towards the formation of diversified ecosystems (Schaefer 1994, Argel-de-Oliveira 1996) and the heterogeneity of natural environments is one of the most important factors that contribute to an increase in biodiversity (Karr 1976). Such characteristics of the urbanized areas enhanced the approach of the Conservation Science workers to get involved in the studies related to urban biodiversity (McDonnell and Pickett 1990, Alvey 2006, Garden *et al.* 2006) and their dynamics especially avifauna which were otherwise overlooked before 1990s (Botkin and Beveridge 1997, McDonnell *et al.* 1997, Savard *et al.* 2000).

The Cartesian dichotomy or paradigm has reinforced many ancient western cultural expressions of nature domination by placing 'humans' above 'nature', as if we were neither interconnected nor interdependent. For centuries, western society has controlled and dominated nature and become more and more disconnected from it. The human-nature dualism has proven to be one of the most important modern causes of human degradation of the biosphere. Urban ecological conservation is the ideal cultural milieu in which to force this confrontation with our current relationship with nature. In the City, many of us humans are living in close proximity to our fellow members of the universe. We have to share our living space, our natural resources. Owing to wide ranges of climatic variations, edaphic characters, physiography, topography and geology, Rajasthan has a diversity of habitats. These habitats harbor rich variety of fauna especially avifauna. Out of 500 bird species reported from the state (Islam and Rahmani 2004), habitats of the eastern and southern parts of the state are the shelter of more than 80% of the reported bird species (Sharma 2002). The State of Rajasthan is one of the driest state of the country and the total surface water resources in the State is only about 1% of the total surface water resources of the country. Nevertheless there are thousands of temporary freshwater and salt aquatic bodies in the region, varying enormously in size. 52 wetlands, including three natural, have been identified in state which expands in approx. 34% of the geographic area of state (Anon. 1990). The surface water play major role in providing the breeding and resting ground to aquatic birds depending on its characteristics with respect to the food availability and protection. The surface water

resources in Rajasthan are mainly confined to south and southeastern part of the State. Known for the wetland ecosystem, “City of Lakes” or ‘Venice of the East”, Udaipur is one of the dreamt destinations of the international tourists. The water bodies of the ‘lake city’ play an important role in several spheres of human interest: culturally, socially, scientifically and economically. After fish, birds are probably the most important faunal group that attracts people to wetlands.

Alike all over the world birds especially water birds attracted the attention of ornithologists, specialists on hunting management and hunters from the very past time in the princely state of Rajasthan (Adam 1873, Barnes 1891, Oates 1899, Messurier 1904, Impey 1909, Whistler 1938, Prakash 1960, Kushlan 1986). Many species of the waterbirds are migratory, undertaking annual migrations along different flyways spanning the length and breadth of the globe between their breeding and non-breeding grounds (Ali 1959, Alerstam 1990).

The ornithological studies in Southern Rajasthan were mainly confined to the Abu Hills in the Sirohi district (Butler 1875-1876) and parts of the Udaipur district (Hume 1878) in pre-independence era. In Udaipur it was followed by the work of Sharma and Tehsin (1994), Sharma (1998), Sharma (2002), Mehra (2005) and Mehra *et al.* (2010). Monitoring of waterbirds can provide valuable information on the status of wetlands (Custer *et al.* 1991, Kushlan 1993), and can be a key tool for increasing the awareness of importance of wetlands and conservation values. There is growing concern of the need to conserve waterbirds and wetlands and recognition that birds can serve as indicators of the health of our surroundings (Anon 2001). Cities are dependent on the ecosystems beyond the city limits, but also benefit from internal urban ecosystems (Bolund and Hunhammar 1999).

The purpose of this contribution is to present a preliminary analysis of the avifaunal composition in the terrestrial and aquatic habitats of the urban areas of Udaipur (Rajasthan, India) and its value for the community with respect to socio-ecological aspects. The study assesses the avifaunal diversity found in urban areas of Udaipur and suggests the measures to safeguard and enhance the biodiversity of the area, and doing so to improve the quality of peoples' lives through contact with, appreciation of, and involvement in nature conservation.

METHODS

I. Avifaunal Surveys and Field Methods

Seasonal field surveys were conducted for a period of five years from July 2004 to Jun 2009 for the collection of data. Three seasons namely, winter, monsoon and summers were considered for monitoring and collecting data. Urban habitats were broadly divided into – urban terrestrial and urban aquatic habitats. They were further categorized into sub-habitats for the ease of data collection and interpretation.

1. Urban Terrestrial (T) habitats: These habitats were categorized into following six sub-habitats:
 - a. Protected Area (TPA) – Sajjangarh Wildlife Sanctuary
 - b. Public Park (TPP) – Sajjan Niwas Garden
 - c. Forest Fragments (TFF) – Baghdara, Khas Odhi and Moti Magri

- d. Agricultural Field (TAF) – fields of MPAUT and those present on the borders of Udaipur partially representing rural
 - e. Institutional Green Spaces (TIGS) – Administrative campuses of universities (Mohanlal Sukhadia University and Maharana Pratap University of Agriculture & Technology)
 - f. Constructed Areas (TCA) – denotes selected roads, buildings within city
2. Urban Aquatic (W) Habitats: These habitats were categorized into following three sub-habitats:
- a. Urban Lakes (WUL) – Pichola, Saroop Sagar, Fatehsagar
 - b. Peri-urban Lake (WPUL) – Udaisagar, Baghdarrah Lake
 - c. Other Aquatic bodies (WOA) – Govardhan Sagar, Connecting Links (Ahar), Small temporary pools within terrestrial habitats of Khas Odhi, Sajjan Niwas, constructed areas etc.

Seasonal surveys were conducted in the morning (6.00-12.00) and late afternoon or evening (15.00-18.00) hours. Different sampling methods were employed as per the requirement. Bird species were assessed in representative plots using the Line Transect Method (LTM) and or modified Transect Method (RTM) (see Bibby *et al.* 2000, Javed and Kaul 2002, Urfi *et al.* 2005) and Point Count Method (PCM) for farmland, forest hills, gardens, groves, plantations and protected areas (Hutto *et al.* 1986), and Total Count Method (TCM) for wetland habitats with less than 5 km perimeter (Burnham *et al.* 1980, Hoves and Bakewell 1989). The common and scientific names of the bird species are after Manakadan and Pittie (2001). All birds seen or heard within a 100-m radius during a 5-min period were recorded to species at each sampling location using the PCM (Hutto *et al.* 1986). The resource guides used for the identification and description were Ali and Ripley (1968 – 1999), Grimmett *et al.* (1999) and Grimmett *et al.* (2004).

Status of the bird species recorded from the urban habitats was assigned as: R: Resident; R/LM: Resident with Local Movement; LM: Local Movement; R/WM: Resident with Winter Movement; R/WM/LM: Resident with Winter as well as Local Movement; WM: Winter Migrant; WM/PM: Winter Migrant with Passage Migration; WM/R: Winter Migrant with Resident; SM: Summer Migrant.

II. Assessment of Urban Sub-habitats

Yearlong observations (July 2005- Jun 2006) on the human accessibility were made on the different points for particular site for assessment of the sub-habitats.

Disturbance Level

The disturbance levels of the sub-habitats were rated as according to presence of human or other anthropogenic activities with relation to peak bird activities in morning hours from ½h before sunrise to 4h after sunrise):

1. High Disturbance (Rating - 3) – activities or movements of humans for all the observing points or transect at particular site in peak bird activity hours;
2. Moderate Disturbance (Rating - 2) – activities or movements of humans for/or near about half period at all the observing points or transect at particular site in peak bird activity hours;

3. Low Disturbance (Rating - 1) – activities or movements of humans for/or near about one-fourth period at all the observing points or transect at particular site in peak bird activity hours;

Accessibility Level

The accessibility level of human denotes the approach of the sub-habitats for a common man. The assessment included three points – a) Nearness from residential area, b) Frequency of use by local residents; and c) Ownership - public property and/or permitted site for common man. Based on these three criteria, rating on human accessibility was given:

1. All the sites of sub-habitat fulfills all the three points (Rating - 1)
2. All the sites of sub-habitat fulfills either points 'a' and 'c' or 'b' and 'c' (Rating - 2)
3. All the sites of sub-habitat does not fulfills point 'c' (Rating - 3)

Importance Level

The assessment of the importance of the sub-habitats was made through interactions with at least 50 people per season found at particular site of observation on the issues of direct or indirect benefits related to residence, education, recreation, economic and other:

A. based on the use of local community

1. Frequently used (Rating - 1)
2. Occasionally used (Rating - 2)
3. Rarely used (Rating - 3)

B. based on the use of global community

1. Frequently used (Rating - 1)
2. Occasionally used (Rating - 2)
3. Rarely used (Rating - 3)

Potential and Scope of Eco-tourism

Through the analysis of the views of the locals and other parameters of characteristics required for developing tourism site, potential and scope of the urban habitats for developing site as eco-tourism especially related to birding site were interpreted. Site was rated as accordingly:

1. Could be developed as hotspot for eco-tourism (Rating - 1)
2. Could be used alternative site for ecotourism (Rating - 2)
3. Least important for eco-tourism (Rating - 3)

OBSERVATIONS AND RESULTS

In total, 242 species of birds belonging to 68 families were recorded from the urban habitats of Udaipur during the period of five years from July 2004 to Jun 2009 (Tables 1, 2A, 2B). Out of the total, 140 bird species representing 42 families were recorded from the terrestrial habitats whereas 102 bird species representing 26 families were recorded from aquatic habitats. Five species of global importance, namely, Indian White-backed Vulture; Long-billed Vulture; Green Munia from terrestrial habitats and Spot-billed Pelican; Indian Skimmer from aquatic habitats,

recorded in the past from the study area were also enlisted in the checklist but not sighted during the course of study (Table 1, 2A).

Terrestrial habitats

Urban terrestrial habitats were surveyed into six heads, namely, Protected Area (TPA), Public Park (TPP), Forest Fragments (TFF), Agricultural Field (TAF), Institutional Green Spaces (TIGS) and Constructed Areas (TCA).

Terrestrial bird species - Occurrence

Around 140 species were recorded from different terrestrial habitats of the urban areas of Udaipur. Highest number of species was 136, recorded from the fragmented forest (TFF) areas lying in and around Udaipur. This was followed by the terrestrial habitats of the protected area (TPA), which harbored 118 species. Interestingly, over 90 bird species were recorded from the institutional campuses (TAF and TIGS). Habitat of the green space within city, viz. Sajjan Niwas Park (TPP) was home for only 84 bird species. Almost 60 species found shelter in the close proximity of human settlements, i.e., constructed structures (TCA). Figure 1 present species recorded from the urban terrestrial habitats.

Terrestrial bird species – Status

Maximum species (approximately 56%) of the total recorded terrestrial bird species were local residents (R) of the study area whereas 16% were resident with local movement (R/LM). Approx. 20% of the total terrestrial species were winter migratory (WM). They were mainly from the three families, namely, Turdinae, Sylviinae and Muscicapinae. One species of each was showing local movement (LM), resident with winter movement (R/WM) and winter migration with resident (WM/R). Four species were winter migrant with passage migration (WM/PM) and two species were summer migrants (SM) recorded from the study area. Figure 2 is the graphic presentation showing status of the terrestrial bird species recorded from the study area whereas Figure 3A is the pie diagram presenting the proportion of the recorded terrestrial bird species according to their status.

Aquatic habitats

Urban aquatic habitats were surveyed into three heads, namely, Urban Lakes (WUL), Peri-urban Lake (WPUL) and Other Aquatic bodies (WOA).

Aquatic bird species - Occurrence

Aquatic bird species, categorized into wetland species and wetland dependent species, accounted 102 from the study area. 84 species were wetland species whereas 18 species were wetland dependent. Aquatic habitats from the peri-urban areas (WPUL) harbored all the 102 aquatic species whereas 87 species were recorded from urban lakes (WUL). Surprisingly, small aquatic bodies and linking canals (WOA) were home for 46 aquatic species. Figure 1 presents a picture of the number of species in different aquatic habitats. 12 aquatic species were also sighted from the terrestrial habitats of the study area.

Aquatic bird species – Status

Maximum species (approximately 46%) of the total recorded aquatic bird species were winter migrants (WM) which showed their presence in the winter season. Approx. 33% were resident showing local movement (R/LM) due to decrease or absence of water in main aquatic bodies in summer seasons. Proportion of aquatic resident (R) species was only about 11% of the total. Eight species were resident showed winter movement (R/WM) and one species was resident showing both winter and local movement (R/WM/LM). Figure 2 is the graphic presentation showing status of the aquatic bird species recorded from the study area whereas Figure 3B is the pie diagram presenting the proportion of the recorded aquatic bird species according to their status.

Species of Global Interest

Fifteen bird species enlisted in the globally threatened species, were recorded during the period of study from investigated habitats (Table 3). Out of these one each from the list of Critical Endangered (Red-headed Vulture) and Endangered (Egyptian Vulture), four categorized from the list of Vulnerable, namely Dalmatian Pelican, Lesser Kestrel, Sarus Crane and Pied Tit, showed their presence in the study area. Remaining nine species were the Near Threatened species, namely Darter, Painted Stork, Black-necked Stork, Oriental White Ibis, Lesser Flamingo, Ferruginous Pochard, Black-tailed Godwit, Black-bellied Tern and European Roller.

Four of the 15 globally threatened species were terrestrial whereas 11 were aquatic species. All the four terrestrial globally threatened species were recorded from the urban terrestrial habitats categorized as forest fragments (TFF) and agricultural fields (TAF). Similarly, maximum of the aquatic threatened species were sighted from the urban aquatic habitats categorized as peri-urban lakes (WPUL) which harbored ten globally threatened species whereas only seven aquatic threatened species were sighted in urban lakes (WUL).

Characteristics of urban habitats

Least disturbed urban habitats include protected areas (TPA), forest fragments (TFF) and peri-urban lakes (WPUL) which were rated one. Only habitats of main human settlements (TCA) were found highly disturbed whereas public park (TPP), agriculture field (TAF), institutional green spaces (TIGS) and other aquatic habitats (WUL and WOA) were moderately disturbed.

The habitats TPA, TPP TCA, WUL and partly TFF were maximum accessible for any visitors, therefore, rated one. On the other hand, TAF, TIGS and partly TFF (Khas Odhi) were least accessible in terms of visiting the sites, hence rated three whereas, aquatic habitats WPUL and WOA were having moderate accessibility,

On the local scale, the habitats which are maximally used by residents were TPP, TCA and WUL whereas site TPA WPUL and WOA were least used by local public, hence of low importance. On the global reach, TPA, WUL and WPUL were maximally accessed and TPP, TFF, TAF, TIGS, TCA and WOA were of least importance for the visitors or are overlooked due to low concern.

Thus, as according to potential and scope for developing eco-tourism sites which could be of great interest for both the local and global community include habitats TPA, TFF, WUL and WPUL. Out of these TPA and WPUL were already visited by the global community with the point of view of its beauty rather than natural heritage. These habitats have the potential to develop sites for birding and involve local community for employment. This would be helpful in achieving the aims and objectives of Conservation Sciences also.

Table 4 is summary of the assessment of the terrestrial habitats of the Udaipur which could be a source of socio-ecological aspects of research and its implementation.

Still there is much need of analysis of the inclination of the local community to step ahead for the new global responsibility of employment generation through conservation.

CONCLUSIVE REMARKS

Conservation through Community Participation: There is always a conflict between protection of habitats and human involvement. Uncontrolled urbanization has forced both wetland habitats and biodiversity in a situation that both are struggling for their existence. There is need to bring the concept of conserving these habitats as well as biodiversity. Community based nature conservation that is coming up very successful in many parts of the globe could be used in Udaipur. This could be income generating source providing employment to the local residents and the mass involvement to conserve the diversity from ecological point of view.

Udaipur is already on World Tourism Map due to its scenic beauty and Historical importance, the natural heritage of the place is still unexploited source of income generation in the urban areas. The coordinated and integrated approach of different government departments as well as academic research is required for the site to achieve its importance regarding potential of Nature Tourism.

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Table 1: Terrestrial bird species recorded during study period (2004-2009) from urban habitats of Udaipur

Sr. No.	Common Name Scientific Name	Status	Terrestrial Habitats						Aquatic Habitats		
			TPA	TPP	TFF	TAF	TIGS	TCA	WUL	WPUL	WOA
1	Hawks, Eagles, Buzzards, Old World Vultures, Kites, Harriers Accipitridae										
1	Oriental Honey-Buzzard (129-130) <i>Pernis ptilorhynchus</i> (Temminck, 1821)	R/LM	x	-	x	-	x	-	-	-	-
2	Black-shouldered Kite (124) <i>Elanus caeruleus</i> (Desfontaines, 1789)	R/LM	x	x	x	x	x	x	-	-	-
3	Black Kite (132-134) <i>Milvus migrans</i> (Boddaert, 1783)	R	x	x	x	x	x	x	-	-	-
4	Egyptian Vulture (186-187) <i>Neophron percnopterus</i> (Linnaeus, 1758)	R	x	-	x	x	x	x	-	-	-
5	Indian White-backed Vulture (185) <i>Gyps bengalensis</i> (Gmelin, 1788)	?	-	-	-	-	-	-	-	-	-
6	Long-billed Vulture (182) <i>Gyps indicus</i> (Scopoli, 1786)	?	-	-	-	-	-	-	-	-	-
7	Red-headed Vulture (178) <i>Sarcogyps calvus</i> (Scopoli, 1786)	LM	x	-	x	-	-	-	-	-	-
8	Short-toed Snake-Eagle (195) <i>Circaetus gallicus</i> (Gmelin, 1788)	R/LM	x	-	x	-	-	-	-	-	-
9	Crested Serpent-Eagle (196-200) <i>Spilornis cheela</i> (Latham, 1790)	R/LM	x	-	x	-	-	-	-	-	-
10	Pallid Harrier (190) <i>Circus macrourus</i> (S.G. Gmelin, 1770)	WM	-	-	-	x	-	-	-	-	-
11	Shikra (137-140) <i>Accipiter badius</i> (Gmelin, 1788)	R	x	x	x	x	x	x	-	-	-
12	White-eyed Buzzard (157) <i>Butastur teesa</i> (Franklin, 1832)	R/LM	x	-	x	-	-	-	-	-	-
13	Tawny Eagle (168) <i>Aquila rapax</i> (Temminck, 1828)	R/LM	-	-	x	-	-	-	-	-	-
14	Changeable Hawk-Eagle (160-162) <i>Spizaetus cirrhatus</i> (Gmelin, 1788)	R/LM	-	-	x	-	-	-	-	-	-
2	Falcons Falconidae										
15	Lesser Kestrel (221) <i>Falco naumanni</i> Fleischer, 1818	WM/PM	-	-	x	-	-	-	-	-	-
3	Pheasants, Partridges, Quails Phasianidae										
16	Grey Francolin (244-246) <i>Francolinus pondicerianus</i> (Gmelin, 1789)	R	x	x	x	x	x	x	-	-	-
17	Common Quail (250) <i>Coturnix coturnix</i> (Linnaeus, 1758)	WM	x	-	x	x	-	-	-	-	-
18	Rain Quail (252) <i>Coturnix coromandelica</i> (Gmelin, 1789)	R/LM	x	x	x	x	x	-	-	-	-
19	Jungle Bush-Quail (255-258) <i>Perdicula asiatica</i> (Latham, 1790)	R/LM	x	x	x	-	-	-	-	-	-
20	Rock Bush-Quail (259-261) <i>Perdicula argoondah</i> (Sykes, 1832)	R	x	x	x	x	x	-	-	-	-
21	Indian Peafowl (311) <i>Pavo cristatus</i> Linnaeus, 1758	R	x	x	x	x	x	x	-	-	-
4	Stone-Curlew & Stone-Plovers/Thick-knees Burhinidae										
22	Stone-Curlew (435-436) <i>Burhinus oediconemus</i> (Linnaeus, 1758)	R	x	-	x	x	x	-	-	-	-
5	Courser & Pratincoles Glareolidae										
23	Indian Courser (440) <i>Cursorius coromandelicus</i> (Gmelin, 1789)	R/LM	-	-	x	-	-	-	-	-	-
6	Pigeons & Doves Columbidae										
24	Blue Rock Pigeon (516-517) <i>Columba livia</i> Gmelin, 1789	R	x	x	x	x	x	x	-	-	-
25	Oriental Turtle-Dove (530-533) <i>Streptopelia orientalis</i> (Latham, 1790)	WM	x	x	x	-	x	-	-	-	-
26	Little Brown Dove (541) <i>Streptopelia senegalensis</i> (Linnaeus, 1766)	R	x	x	x	x	x	x	-	-	-
27	Spotted Dove (537-540) <i>Streptopelia chinensis</i> (Scopoli, 1786)	R	x	x	x	x	x	x	-	-	-

28	Red Collared-Dove (535-536) <i>Streptopelia tranquebarica</i> (Hermann, 1804)	R	x	x	x	x	x	x	-	-	-
29	Eurasian Collared-Dove (534) <i>Streptopelia decaocto</i> (Frisch, 1838)	R	x	x	x	x	x	x	-	-	-
30	Yellow-legged Green-Pigeon (503-505) <i>Treron phoenicoptera</i> (Latham, 1790)	R/LM	x	x	x	-	x	-	-	-	-
7	Parakeets Psittacidae										
31	Alexandrine Parakeet (545-548) <i>Psittacula eupatria</i> (Linnaeus, 1766)	R/LM	x	-	x	-	-	-	-	-	-
32	Rose-ringed Parakeet (549-550) <i>Psittacula krameri</i> (Scopoli, 1769)	R	x	x	x	x	x	x	-	-	-
33	Plum-headed Parakeet (557-558) <i>Psittacula cyanocephala</i> (Linnaeus, 1766)	R/LM	x	x	x	x	x	x	-	-	-
8	Cuckoos, Malkohas & Coucals Cuculidae										
34	Pied Crested Cuckoo (570-571) <i>Clamator jacobinus</i> (Boddaert, 1783)	SM	x	x	x	x	x	-	-	-	-
35	Brainfever Bird (573-574) <i>Hierococcyx varius</i> (Vahl, 1797)	R/LM	x	x	x	x	x	x	-	-	-
36	Indian Plaintive Cuckoo (584) <i>Cacomantis passerinus</i> (Vahl, 1797)	R/LM	x	-	x	-	-	-	-	-	-
37	Asian Koel (590-592) <i>Eudynamis scolopacea</i> (Linnaeus, 1758)	R	x	x	x	x	x	x	-	-	-
38	Sirkeer Malkoha (596-598) <i>Phaenicophaeus leschenaultii</i> (Lesson, 1830)	R	x	-	x	-	-	-	-	-	-
39	Greater Coucal (600-602) <i>Centropus sinensis</i> (Stephens, 1815)	R	x	x	x	x	x	x	-	-	-
9	Owls Strigidae										
40	Collared Scops-Owl (619-624) <i>Otus bakkamoena</i> Pennant, 1769	R	x	x	x	x	x	x	-	-	-
41	Eurasian Eagle-Owl (625-627) <i>Bubo bubo</i> (Linnaeus, 1758)	R/LM	x	-	x	-	-	-	-	-	-
42	Dusky Eagle-Owl (630) <i>Bubo coromandus</i> (Latham, 1790)	R/LM	-	-	x	-	-	-	-	-	-
43	Spotted Owlet (650-652) <i>Athene brama</i> (Temminck, 1821)	R	x	x	x	x	x	x	-	-	-
44	Short-eared Owl (664) <i>Asio flammeus</i> (Pontoppidan, 1763)	WM	-	-	-	x	x	-	-	-	-
10	Nightjars Caprimulgidae										
45	Indian Jungle Nightjar (670-672a) <i>Caprimulgus indicus</i> Latham, 1790	R	x	-	x	x	x	-	-	-	-
46	Common Indian Nightjar (680-681) <i>Caprimulgus asiaticus</i> Latham, 1790	R	x	-	x	x	x	-	-	-	-
47	Franklin's Nightjar (682) <i>Caprimulgus affinis</i> Horsfield, 1821	R	x	-	x	x	x	-	-	-	-
11	Swifts Apodidae										
48	Asian Palm-Swift (707-708) <i>Cypsiurus balasienis</i> (J.E. Gray, 1829)	R	-	-	x	-	-	-	-	-	-
49	House Swift (702-706) <i>Apus affinis</i> (J.E. Gray, 1830)	R	x	x	x	x	x	x	-	-	-
12	Bee-eaters Meropidae										
50	Small Bee-eater (749-752) <i>Merops orientalis</i> Latham, 1801	R	x	x	x	x	x	x	-	-	-
13	Rollers Coraciidae										
51	European Roller (754) <i>Coracias garrulus</i> Linnaeus, 1758	WM/PM	-	-	x	x	x	-	-	-	-
52	Indian Roller (755-757) <i>Coracias benghalensis</i> (Linnaeus, 1758)	R	x	x	x	x	x	x	-	-	-
14	Hoopoes Upupidae										
53	Common Hoopoe (763-766) <i>Upupa epops</i> Linnaeus, 1758	R/WM	x	x	x	x	x	x	-	-	-
15	Hornbills Bucerotidae										

54	Indian Grey Hornbill (767) <i>Ocyrceros birostris</i> (Scopoli, 1786)	R	x	x	x	x	x	x	-	-	-
16	Barbets Capitonidae										
55	Brown-headed Barbet (780-782) <i>Megalaima zeylanica</i> (Gmelin, 1788)	R	x	x	x	x	-	-	-	-	-
56	Coppersmith Barbet (792) <i>Megalaima haemacephala</i> (P.L.S. Müller, 1776)	R	x	x	x	x	x	x	-	-	-
17	Woodpeckers Picidae										
57	Eurasian Wryneck (796) <i>Jynx torquilla</i> Linnaeus, 1758	WM	x	x	x	x	x	-	-	-	-
58	Brown-capped Pygmy Woodpecker (851-854) <i>Dendrocopos nanus</i> (Vigors, 1832)	R	x	x	x	x	x	-	-	-	-
59	Yellow-fronted Pied Woodpecker (847) <i>Dendrocopos mahrattensis</i> (Latham, 1801)	R	x	x	x	x	x	-	-	-	-
60	Lesser Golden-backed Woodpecker (818-823) <i>Dinopium benghalense</i> (Linnaeus, 1758)	R	x	x	x	x	x	x	-	-	-
61	Black-shouldered Woodpecker (858-859) <i>Chrysocolaptes festivus</i> (Boddaert, 1783)	R	x	x	x	x	x	-	-	-	-
18	Larks Alaudidae										
62	Singing Bush-Lark (872) <i>Mirafra cantillans</i> Blyth, 1845	R	x	-	x	-	-	-	-	-	-
63	Red-winged Bush-Lark (875-877) <i>Mirafra erythroptera</i> Blyth, 1845	R	x	-	x	-	x	-	-	-	-
64	Ashy-crowned Sparrow-Lark (878) <i>Eremopterix grisea</i> (Scopoli, 1786)	R	x	-	x	-	x	-	-	-	-
65	Greater Short-toed Lark (885-886) <i>Calandrella brachydactyla</i> (Leisler, 1814)	WM	x	-	x	-	-	-	-	-	-
66	Common Crested Lark (898-900) <i>Galerida cristata</i> (Linnaeus, 1758)	R	x	-	x	-	-	-	-	-	-
67	Eastern Skylark or Oriental Skylark (904-909) <i>Alauda gulgula</i> Franklin, 1831	R	x	-	x	-	-	-	-	-	-
19	Cuckoo-Shrikes, Minivets, Woodshrikes Campephagidae										
68	Large Cuckoo-Shrike (1072-1075) <i>Coracina macei</i> (Lesson, 1830)	R/LM	x	x	x	x	x	-	-	-	-
69	Black-headed Cuckoo-Shrike (1078-1079) <i>Coracina melanoptera</i> (Rüppell, 1839)	R/LM	-	-	x	-	-	-	-	-	-
70	Small Minivet (1090-1095) <i>Pericrocotus cinnamomeus</i> (Linnaeus, 1766)	R	x	-	x	-	-	-	-	-	-
71	White-bellied Minivet (1096) <i>Pericrocotus erythropygius</i> (Jerdon, 1840)	R/LM	x	-	x	-	x	-	-	-	-
72	Common Woodshrike (1069-1071) <i>Tephrodornis pondicerianus</i> (Gmelin, 1789)	R	x	x	x	x	x	-	-	-	-
20	Bulbuls Pycnonotidae										
73	Red-vented Bulbul (1126-1132) <i>Pycnonotus cafer</i> (Linnaeus, 1766)	R	x	x	x	x	x	x	-	-	-
21	loras Irenidae										
74	Common lora (1097-1101) <i>Aegithina tiphia</i> (Linnaeus, 1758)	R	x	x	x	x	x	x	-	-	-
75	Marshall's lora (1102) <i>Aegithina nigrolutea</i> (Marshall, 1876)	R	x	x	x	-	-	-	-	-	-
22	Shrikes Laniidae										
76	Rufous-tailed Shrike (942-943) <i>Lanius isabellinus</i> Hemprich & Ehrenberg, 1833	WM	x	-	x	-	-	-	-	-	-
77	Brown Shrike (949-950a) <i>Lanius cristatus</i> Linnaeus, 1758	WM	x	-	x	-	-	-	-	-	-

78	Bay-backed Shrike (939-940) <i>Lanius vittatus</i> Valenciennes, 1826	R	x	x	x	-	-	-	-	-	-
79	Rufous-backed Shrike (946-948) <i>Lanius schach</i> Linnaeus, 1758	R	x	x	x	x	x	x	-	-	-
23	Thrushes, Robins, Wheaters Turdinae										
80	Blue Rock-Thrush (1725-1726) <i>Monticola solitarius</i> (Linnaeus, 1758)	WM	-	-	x	-	x	-	-	-	-
81	Siberian Rubythroat (1643) <i>Luscinia calliope</i> (Pallas, 1776)	WM	x	-	x	-	-	-	-	-	-
82	Bluethroat (1644-1646a) <i>Luscinia svecica</i> (Linnaeus, 1758)	WM	x	x	x	x	x	-	-	-	-
83	Oriental Magpie-Robin (1661-1664) <i>Copsychus saularis</i> (Linnaeus, 1758)	R	x	x	x	x	x	x	-	-	-
84	Indian Robin (1717-1721) <i>Saxicoloides fulicata</i> (Linnaeus, 1776)	R	x	x	x	x	x	x	-	-	-
85	Black Redstart (1671-1672) <i>Phoenicurus ochruros</i> (Gmelin, 1774)	WM	x	x	x	x	x	x	-	-	-
86	Common Stonechat (1695-1698) <i>Saxicola torquata</i> (Linnaeus, 1766)	WM	x	-	x	x	x	-	-	-	-
87	Pied Bushchat (1700-1703) <i>Saxicola caprata</i> (Linnaeus, 1766)	WM	x	-	x	x	x	-	-	-	-
88	Variable Wheatear (1712) <i>Oenanthe picata</i> (Blyth, 1847)	WM	x	-	x	x	x	-	-	-	-
89	Desert Wheatear (1709-1710) <i>Oenanthe deserti</i> (Temminck, 1825)	WM	x	-	x	x	x	-	-	-	-
90	Isabelline Wheatear (1706) <i>Oenanthe isabellina</i> (Temminck, 1829)	WM	x	-	x	x	x	-	-	-	-
91	Indian Chat (1692) <i>Cercomela fusca</i> (Blyth, 1851)	R	x	x	x	x	x	x	-	-	-
24	Babblers Timaliinae										
92	Rufous-bellied Babbler (1219-1223) <i>Dumetia hyperythra</i> (Franklin, 1831)	R	-	x	x	-	-	-	-	-	-
93	Yellow-eyed Babbler (1230-1232) <i>Chrysomma sinense</i> (Gmelin, 1789)	R	x	x	x	x	x	x	-	-	-
94	Common Babbler (1253-1254) <i>Turdoides caudatus</i> (Dumont, 1823)	R	-	-	x	x	x	-	-	-	-
95	Large Grey Babbler (1258) <i>Turdoides malcolmi</i> (Sykes, 1832)	R	x	x	x	x	x	x	-	-	-
96	Jungle Babbler (1261-1265) <i>Turdoides striatus</i> (Dumont, 1823)	R	x	x	x	x	x	-	-	-	-
25	Prinias, Warblers Sylviinae										
97	Streaked Fantail-Warbler (1498-1500a) <i>Cisticola juncidis</i> (Rafinesque, 1810)	R	-	-	-	x	-	x	-	-	-
98	Franklin's Prinia (1502-1505) <i>Prinia hodgsonii</i> Blyth, 1844	R	x	-	-	x	-	x	-	-	-
99	Ashy Prinia (1515-1518) <i>Prinia socialis</i> Sykes, 1832	R	x	x	x	x	x	x	-	-	-
100	Indian Great Reed-Warbler (1550-1552) <i>Acrocephalus stentoreus</i> (Hemprich & Ehrenberg, 1833)	WM	-	-	x	-	-	-	-	-	-
101	Common Tailorbird (1535-1539) <i>Orthotomus sutorius</i> (Pennant, 1769)	R	x	x	x	x	x	x	-	-	-
102	Common Chiffchaff (1574-1575) <i>Phylloscopus collybita</i> (Vieillot, 1817)	WM	x	x	x	x	x	x	-	-	-
103	Olivaceous Leaf-Warbler (1581) <i>Phylloscopus griseolus</i> Blyth, 1847	WM	x	-	x	x	-	-	-	-	-
104	Hume's Warbler (1590-1591) <i>Phylloscopus humei</i> (Brooks, 1878)	WM	x	-	x	x	-	-	-	-	-
105	Greenish Leaf-Warbler (1602-1605) <i>Phylloscopus trochiloides</i> (Sundevall, 1837)	WM	x	-	x	x	-	-	-	-	-
106	Common Lesser Whitethroat (1567-1568) <i>Sylvia curruca</i> (Linnaeus, 1758)	WM	x	x	x	x	x	x	-	-	-
26	Flycatchers Muscicapinae										
107	Red-throated Flycatcher (1411-1412) <i>Ficedula parva</i> (Bechstein, 1792)	WM	x	x	x	x	x	x	-	-	-
108	Ultramarine Flycatcher (1421-1422) <i>Ficedula superciliaris</i> (Jerdon,	WM	x	x	x	-	-	-	-	-	-

	1840)										
109	Verditer Flycatcher (1445) <i>Eumyias thalassina</i> (Swainson, 1838)	WM	-	x	x	-	-	-	-	-	-
110	Tickell's Blue-Flycatcher (1442-1443) <i>Cyornis tickelliae</i> Blyth, 1843	WM	x	x	x	x	x	x	-	-	-
111	Grey-headed Flycatcher (1448-1449) <i>Culicicapa ceylonensis</i> (Swainson, 1820)	WM	x	x	x	x	x	x	-	-	-
27	Monarch-Flycatchers & Paradise-Flycatchers Monarchinae										
112	Asian Paradise-Flycatcher (1460-1464) <i>Terpsiphone paradisi</i> (Linnaeus, 1758)	SM	x	x	x	-	x	-	-	-	-
28	Fantail-Flycatchers Rhipidurinae										
113	White-throated Fantail-Flycatcher (1454-1459) <i>Rhipidura albicollis</i> (Vieillot, 1818)	R	x	x	x	x	x	x	-	-	-
114	White-browed Fantail-Flycatcher (1451-1453) <i>Rhipidura aureola</i> Lesson, 1830	R	x	x	x	x	x	x	-	-	-
29	Tits Paridae										
115	Great Tit (1790-1797) <i>Parus major</i> Linnaeus, 1758	R	x	x	x	-	x	-	-	-	-
116	Pied Tit or White-naped Tit (1798) <i>Parus nuchalis</i> Jerdon, 1844	R	x	-	x	-	-	-	-	-	-
117	Black-lored Yellow Tit (1809-1811) <i>Parus xanthogenys</i> Vigors, 1831	R	-	x	x	-	-	-	-	-	-
30	Creepers Certhiidae										
118	Spotted Creeper (1840-1841) <i>Salpornis spilonotus</i> (Franklin, 1831)	R	-	x	x	-	-	-	-	-	-
31	Sunbirds Nectariniidae										
119	Purple Sunbird (1916-1918) <i>Nectarinia asiatica</i> (Latham, 1790)	R	x	x	x	x	x	x	-	-	-
32	White-eyes Zosteropidae										
120	Oriental White-eye (1933-1936) <i>Zosterops palpebrosus</i> (Temminck, 1824)	R	x	x	x	x	x	x	-	-	-
33	Buntings Emberizinae										
121	Crested Bunting (2060) <i>Melophus lathamii</i> (Gray, 1831)	R/LM	x	x	x	-	-	-	-	-	-
34	Finches Fringillidae										
122	Common Rosefinch (2010-2013) <i>Carpodacus erythrinus</i> (Pallas, 1770)	WM/R	-	-	x	-	-	-	-	-	-
35	Munias (Estrildid Finches) Estrildidae										
123	Red Munia (1964) <i>Amandava amandava</i> (Linnaeus, 1758)	R	-	-	x	-	-	-	-	-	-
124	Green Munia (1965) <i>Amandava formosa</i> (Latham, 1790)	?	-	-	-	-	-	-	-	-	-
125	White-throated Munia (1966) <i>Lonchura malabarica</i> (Linnaeus, 1758)	R	x	x	x	x	x	x	-	-	-
126	Spotted Munia (1974-1975) <i>Lonchura punctulata</i> (Linnaeus, 1758)	R	-	-	x	x	x	-	-	-	-
36	Sparrows Passerinae										
127	House Sparrow (1938-1939a) <i>Passer domesticus</i> (Linnaeus, 1758)	R	x	x	x	x	x	x	-	-	-
128	Yellow-throated Sparrow (1948-1949) <i>Petronia xanthocollis</i> (Burton, 1838)	R	x	x	x	x	x	-	-	-	-
37	Weavers Ploceinae										
129	Baya Weaver (1957-1959) <i>Ploceus philippinus</i> (Linnaeus, 1766)	R	x	x	x	x	x	x	-	-	-
38	Starlings & Mynas Sturnidae										
130	Grey-headed Starling (987-989) <i>Sturnus malabaricus</i> (Gmelin, 1789)	WM/PM	-	x	x	-	-	-	-	-	-

131	Brahminy Starling (994) <i>Sturnus pagodarum</i> (Gmelin, 1789)	R	x	x	x	x	x	x	-	-	-
132	Rosy Starling (996) <i>Sturnus roseus</i> (Linnaeus, 1758)	WM/PM	x	x	x	x	x	x	-	-	-
133	Asian Pied Starling (1002-1004) <i>Sturnus contra</i> Linnaeus, 1758	R	x	x	x	x	x	x	-	-	-
134	Common Myna (1006-1007) <i>Acridotheres tristis</i> (Linnaeus, 1766)	R	x	x	x	x	x	x	-	-	-
135	Bank Myna (1008) <i>Acridotheres ginginianus</i> (Latham, 1790)	R	x	x	x	x	x	x	-	-	-
39	Orioles Oriolidae										
136	Eurasian Golden Oriole (952-953) <i>Oriolus oriolus</i> (Linnaeus, 1758)	R/LM	x	x	x	-	x	-	-	-	-
40	Drongos Dicruridae										
137	Black Drongo (962-964) <i>Dicrurus macrocercus</i> Vieillot, 1817	R	x	x	x	x	x	x	-	-	-
138	Ashy Drongo (965-966b) <i>Dicrurus leucophaeus</i> Vieillot, 1817	WM	x	-	x	-	-	-	-	-	-
139	White-bellied Drongo (967-969) <i>Dicrurus caeruleus</i> (Linnaeus, 1758)	R	x	-	x	x	-	-	-	-	-
41	Woodswallows Artamidae										
140	Ashy Woodswallow (982) <i>Artamus fuscus</i> Vieillot, 1817	R/LM	x	-	x	-	-	-	-	-	-
42	Crows, Treepies Corvidae										
141	Indian Treepie (1030a-1034) <i>Dendrocitta vagabunda</i> (Latham, 1790)	R	x	x	x	x	x	x	-	-	-
142	House Crow (1048-1051) <i>Corvus splendens</i> Vieillot, 1817	R	x	x	x	x	x	x	-	-	-
143	Jungle Crow (1054-1057) <i>Corvus macrorhynchos</i> Wagler, 1827	R	x	x	x	x	x	x	-	-	-
	Total		118	84	136	91	92	59	0	0	0

(225-256): Numbers within brackets after the common names are the numbers given to species in Ripley's (1982) Synopsis, which was also followed in Ali & Ripley's Handbook

(?) denotes the records of species from the site before the 2004 or reported by other workers at same site during same period

UR: Unrecorded; R: Resident; R/LM: Resident with Local Movement; R/WM: Resident with Winter Movement; R/WM/LM: Resident with Winter as well as Local Movement; WM: Winter Migrant; WM/PM: Winter Migrant with Passage Migration; SM: Summer Migrant

Table 2 A: Aquatic bird species (Wetland) recorded during study period (2004-2009) from urban habitats of Udaipur

Sr. No.	Common Name Scientific Name	Status	Terrestrial Habitats						Aquatic Habitats		
			TPA	TPP	TFF	TAF	TIGS	TCA	WUL	WPUL	WOA
1	Grebes Podicipedidae										
1	Little Grebe (5) <i>Tachybaptus ruficollis</i> (Pallas, 1764)	R/LM	-	-	-	-	-	-	X	X	X
2	Great Crested Grebe (3) <i>Podiceps cristatus</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	-	X	-
2	Pelicans Pelecanidae										
3	Great White Pelican (20) <i>Pelecanus onocrotalus</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	-
4	Spot-billed Pelican (21) <i>Pelecanus philippensis</i> Gmelin, 1789	?	-	-	-	-	-	-	-	-	-
5	Dalmatian Pelican (22) <i>Pelecanus crispus</i> Bruch, 1832	WM	-	-	-	-	-	-	X	X	-
3	Cormorants/Shags Phalacrocoracidae										
6	Little Cormorant (28) <i>Phalacrocorax niger</i> (Vieillot, 1817)	R/LM	-	-	-	-	-	-	X	X	X
7	Indian Shag (27) <i>Phalacrocorax fuscicollis</i> Stephens, 1826	R/LM	-	-	-	-	-	-	X	X	-
8	Great Cormorant (26) <i>Phalacrocorax carbo</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	X	X	X
4	Darters Anhingidae										
9	Darter (29) <i>Anhinga melanogaster</i> Pennant, 1769	R/LM	-	-	-	-	-	-	X	X	-
5	Herons, Egrets & Bitterns Ardeidae										
10	Little Egret (49) <i>Egretta garzetta</i> (Linnaeus, 1766)	R	-	-	-	-	-	-	X	X	X
11	Grey Heron (35-36) <i>Ardea cinerea</i> Linnaeus, 1758	R/WM	-	-	-	-	-	-	X	X	-
12	Purple Heron (37-37a) <i>Ardea purpurea</i> Linnaeus, 1766	R/LM	-	-	-	-	-	-	X	X	-
13	Large Egret (45-46) <i>Casmerodius albus</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	X	X	X
14	Median Egret (47, 48) <i>Mesophoyx intermedia</i> (Wagler, 1829)	R/LM	-	-	-	-	-	-	X	X	X
15	Cattle Egret (44) <i>Bubulcus ibis</i> (Linnaeus, 1758)	R	-	-	-	-	-	-	X	X	X
16	Indian Pond-Heron (42-42a) <i>Ardeola grayii</i> (Sykes, 1832)	R/LM	-	-	-	-	-	-	X	X	X
17	Little Green Heron (38-41) <i>Butorides striatus</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	X	X	-
18	Black-crowned Night-Heron (52) <i>Nycticorax nycticorax</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	X	X	-
6	Storks Ciconiidae										
19	Painted Stork (60) <i>Mycteria leucocephala</i> (Pennant, 1769)	R/LM	-	-	-	-	-	-	X	X	-
20	Asian Openbill-Stork (61) <i>Anastomus oscitans</i> (Boddaert, 1783)	R/LM	-	-	-	-	-	-	X	X	-
21	White-necked Stork (62) <i>Ciconia episcopus</i> (Boddaert, 1783)	R/LM	-	-	-	-	-	-	X	X	-
22	Black-necked Stork (66) <i>Ephippiorhynchus asiaticus</i> (Latham, 1790)	R/LM	-	-	-	-	-	-	-	X	-
7	Ibises & Spoonbills Threskiornithidae										
23	Glossy Ibis (71) <i>Plegadis falcinellus</i> (Linnaeus, 1766)	R/WM/ LM	-	-	-	X	-	-	X	X	X
24	Oriental White Ibis (69) <i>Threskiornis melanocephalus</i> (Latham, 1790)	R/LM	-	-	-	X	-	-	X	X	X
25	Black Ibis (70) <i>Pseudibis papillosa</i> (Temminck, 1824)	R	-	-	-	X	-	-	X	X	X
26	Eurasian Spoonbill (72) <i>Platalea leucorodia</i> Linnaeus, 1758	R/LM	-	-	-	-	-	-	X	X	X
8	Flamingos Phoenicopteridae										
27	Greater Flamingo (73) <i>Phoenicopterus ruber</i> Linnaeus, 1758	R/WM	-	-	-	-	-	-	X	X	-

28	Lesser Flamingo (74) <i>Phoenicopterus minor</i> (Geoffroy, 1798)	WM	-	-	-	-	-	-	-	X	-
9	Geese & Ducks Anatidae										
29	Lesser Whistling-Duck (88) <i>Dendrocygna javanica</i> (Horsfield, 1821)	R/LM	-	-	-	-	-	-	X	X	X
30	Bar-headed Goose (82) <i>Anser indicus</i> (Latham, 1790)	WM	-	-	-	-	-	-	X	X	-
31	Brahminy Shelduck (90) <i>Tadorna ferruginea</i> (Pallas, 1764)	WM	-	-	-	-	-	-	X	X	X
32	Comb Duck (115) <i>Sarkidiornis melanotos</i> (Pennant, 1769)	R/LM	-	-	-	-	-	-	X	X	X
33	Cotton Teal (114) <i>Nettapus coromandelianus</i> (Gmelin, 1789)	R/LM	-	-	-	-	-	-	X	X	X
34	Gadwall (101) <i>Anas strepera</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	-
35	Eurasian Wigeon (103) <i>Anas penelope</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	-
36	Mallard (100) <i>Anas platyrhynchos</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	-
37	Spot-billed Duck (97-99) <i>Anas poecilorhyncha</i> J.R. Forester, 1781	R/LM	-	-	-	-	-	-	X	X	X
38	Northern Shoveller (105) <i>Anas clypeata</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	X
39	Northern Pintail (93) <i>Anas acuta</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	-
40	Garganey (104) <i>Anas querquedula</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	-
41	Common Teal (94) <i>Anas crecca</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	X
42	Red-crested Pochard (107) <i>Rhodonessa rufina</i> (Pallas, 1773)	WM	-	-	-	-	-	-	-	X	-
43	Common Pochard (108) <i>Aythya ferina</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	X	X	-
44	Ferruginous Pochard (109) <i>Aythya nyroca</i> (Guldenstadt, 1770)	WM	-	-	-	-	-	-	X	X	-
45	Tufted Pochard (111) <i>Aythya fuligula</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	X	X	-
10	Cranes Gruidae										
46	Sarus Crane (323-324) <i>Grus antigone</i> (Linnaeus, 1758)	R/LM	-	-	-	X	-	-	-	X	-
47	Demoiselle Crane (326) <i>Grus virgo</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	-	X	-
48	Common Crane (320) <i>Grus grus</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	-	X	-
11	Rails, Crakes, Moorhens, Coots Rallidae										
49	Brown Crake (342) <i>Amaurornis akool</i> (Sykes, 1832)	R/LM	-	-	-	-	-	-	X	X	-
50	White-breasted Waterhen (343-345) <i>Amaurornis phoenicurus</i> (Pennant, 1769)	R	-	-	-	-	-	-	X	X	X
51	Purple Moorhen (348-349) <i>Porphyrio porphyrio</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	X	X	X
52	Common Moorhen (347-347a) <i>Gallinula chloropus</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	X	X	X
53	Common Coot (350) <i>Fulica atra</i> Linnaeus, 1758	R/WM	-	-	-	-	-	-	X	X	X
12	Jacanas Jacanidae										
54	Pheasant-tailed Jacana (358) <i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	R/LM	-	-	-	-	-	-	X	X	X
55	Bronze-winged Jacana (359) <i>Metopidius indicus</i> (Latham, 1790)	R/LM	-	-	-	-	-	-	X	X	-
13	Painted-Snipes Rostratulidae										
56	Greater Painted-Snipe (429) <i>Rostratula benghalensis</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	-	X	-
14	Plovers, Lapwings Charadriidae										
57	Little Ringed Plover (379-380) <i>Charadrius dubius</i> Scopoli, 1786	R/WM	-	-	-	-	-	-	X	X	X
58	Kentish Plover (381-382) <i>Charadrius alexandrinus</i> Linnaeus, 1758	WM	-	-	-	-	-	-	X	X	-
59	Yellow-wattled Lapwing (370) <i>Vanellus malabaricus</i> (Boddaert, 1783)	R/LM	-	-	-	X	-	-	-	X	-

60	Red-wattled Lapwing (366-368) <i>Vanellus indicus</i> (Boddaert, 1783)	R	x	x	x	x	x	x	x	x	x
61	White-tailed Lapwing (362) <i>Vanellus leucurus</i> (Lichtenstein, 1823)	WM	-	-	-	-	-	-	-	x	x
15	Sandpipers, Stints, Snipes, Godwits & Curlews Scolopacidae										
62	Pintail Snipe (406) <i>Gallinago stenura</i> (Bonaparte, 1830)	WM	-	-	-	-	-	-	-	-	x
63	Common Snipe (409) <i>Gallinago gallinago</i> (Linnaeus, 1758)	R/WM	-	-	-	-	-	-	-	x	x
64	Jack Snipe (410) <i>Lymnocyptes minimus</i> (Brünnich, 1764)	WM	-	-	-	-	-	-	-	-	x
65	Black-tailed Godwit (389-390) <i>Limosa limosa</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	-	x	x
66	Bar-tailed Godwit (391-391a) <i>Limosa lapponica</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	-	x	x
67	Spotted Redshank (392) <i>Tringa erythropus</i> (Pallas, 1764)	WM	-	-	-	-	-	-	-	x	x
68	Common Redshank (393, 394) <i>Tringa totanus</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	-	x	x
69	Marsh Sandpiper (395) <i>Tringa stagnatilis</i> (Bechstein, 1803)	WM	-	-	-	-	-	-	-	x	x
70	Common Greenshank (396) <i>Tringa nebularia</i> (Gunner, 1767)	WM	-	-	-	-	-	-	-	x	x
71	Green Sandpiper (397) <i>Tringa ochropus</i> Linnaeus, 1758	WM	-	-	-	-	-	-	-	-	x
72	Wood Sandpiper (398) <i>Tringa glareola</i> Linnaeus, 1758	WM	-	-	-	-	-	-	-	x	x
73	Common Sandpiper (401) <i>Actitis hypoleucos</i> Linnaeus, 1758	R/WM	-	-	-	-	-	-	-	x	x
74	Little Stint (416) <i>Calidris minuta</i> (Leisler, 1812)	WM	-	-	-	-	-	-	-	x	x
75	Temminck's Stint (417) <i>Calidris temminckii</i> (Leisler, 1812)	WM	-	-	-	-	-	-	-	x	x
76	Ruff (426) <i>Philomachus pugnax</i> (Linnaeus, 1758)	WM	-	-	-	-	-	-	-	x	x
16	Avocets & Stilts Recurvirostridae										
77	Black-winged Stilt (430-431) <i>Himantopus himantopus</i> (Linnaeus, 1758)	R	-	-	-	-	-	-	-	x	x
78	Pied Avocet (432) <i>Recurvirostra avosetta</i> Linnaeus, 1758	WM	-	-	-	-	-	-	-	x	x
17	Stone-Curlew & Stone-Plovers/Thick-knees Burhinidae										
79	Great Stone-Plover (437) <i>Esacus recurvirostris</i> (Cuvier, 1829)	R/LM	-	-	x	-	-	-	-	x	x
18	Coursers & Pratincoles Glareolidae										
80	Small Pratincole (444) <i>Glareola lactea</i> Temminck, 1820	R/LM	-	-	-	-	-	-	-	x	x
19	Gulls, Terns Laridae										
81	Black-headed Gull (455) <i>Larus ridibundus</i> Linnaeus, 1766	WM	-	-	-	-	-	-	-	x	x
82	Gull-billed Tern (460-461) <i>Gelochelidon nilotica</i> (Gmelin, 1789)	WM	-	-	-	-	-	-	-	x	x
83	River Tern (463) <i>Sterna aurantia</i> J.E. Gray, 1831	R	-	-	-	-	-	-	-	x	x
84	Black-bellied Tern (470) <i>Sterna acuticauda</i> J.E. Gray, 1831	R/WM	-	-	-	-	-	-	-	x	x
85	Whiskered Tern (458) <i>Chlidonias hybridus</i> (Pallas, 1811)	WM	-	-	-	-	-	-	-	x	x
20	Skimmers Rynchopidae										
86	Indian Skimmer (484) <i>Rynchops albicollis</i> Swainson, 1838	?	-	-	-	-	-	-	-	-	-
	Total		1	1	2	6	1	1	72	84	34

Table 2 B: Aquatic (Wetland dependent) bird species recorded during study period (2004-2009) from Udaipur

Sr. No.	Common Name Scientific Name	Status	Terrestrial Habitats						Aquatic Habitats		
			TPA	TPP	TFF	TAF	TIGS	TCA	WUL	WPUL	WOA
1	Hawks, Eagles, Buzzards, Old World Vultures, Kites, Harriers Accipitridae										
1	Brahminy Kite (135) <i>Haliastur indus</i> (Boddaert, 1783)	R/LM	-	-	x	-	-	-	x	x	-
2	Western Marsh-Harrier (193) <i>Circus aeruginosus</i> (Linnaeus, 1758)	WM	-	-	x	x	-	-	x	x	-
3	Steppe Eagle (169) <i>Aquila nipalensis</i> Hodgson, 1833	WM	-	-	x	-	-	-	-	x	-
2	Osprey Pandionidae										
4	Osprey (203) <i>Pandion haliaetus</i> (Linnaeus, 1758)	WM	-	-	x	-	-	-	x	x	-
3	Owls Strigidae										
5	Brown Fish-Owl (631-632) <i>Ketupa zeylonensis</i> (Gmelin, 1788)	R/LM	-	-	x	-	-	-	-	x	-
4	Kingfishers Alcedinidae										
6	Small Blue Kingfisher (722-724) <i>Alcedo atthis</i> (Linnaeus, 1758)	R	-	-	-	-	-	-	x	x	x
7	White-breasted Kingfisher (735-738) <i>Halcyon smyrnensis</i> (Linnaeus, 1758)	R	-	-	-	-	-	-	x	x	x
8	Lesser Pied Kingfisher (719-720) <i>Ceryle rudis</i> (Linnaeus, 1758)	R/LM	-	-	-	-	-	-	x	x	x
5	Bee-eaters Meropidae										
9	Blue-tailed Bee-eater (748) <i>Merops philippinus</i> Linnaeus, 1766	WM	-	-	-	-	-	-	x	x	x
6	Swallows & Martins Hirundinidae										
10	Common Swallow (916-918) <i>Hirundo rustica</i> Linnaeus, 1758	WM	-	-	-	-	-	-	-	x	-
11	Wire-tailed Swallow (921) <i>Hirundo smithii</i> Leach, 1818	R	-	-	-	-	-	-	x	x	x
12	Red-rumped Swallow (923-928) <i>Hirundo daurica</i> Linnaeus, 1771	R	-	-	-	-	-	-	x	x	x
13	Streak-throated Swallow (922) <i>Hirundo fluvicola</i> Blyth, 1855	R	-	-	-	-	-	-	x	x	x
7	Wagtails & Pipits Motacillidae										
14	White Wagtail (1885-1890) <i>Motacilla alba</i> Linnaeus, 1758	WM	-	-	-	-	-	-	x	x	x
15	Large Pied Wagtail (1891) <i>Motacilla maderaspatensis</i> Gmelin, 1789	R/WM	-	-	-	-	-	-	x	x	x
16	Citrine Wagtail (1881-1883) <i>Motacilla citreola</i> Pallas, 1776	WM	-	-	-	-	-	-	x	x	x
17	Yellow Wagtail (1875-1880) <i>Motacilla flava</i> Linnaeus, 1758	WM	-	-	-	-	-	-	x	x	x
18	Grey Wagtail (1884) <i>Motacilla cinerea</i> Tunstall, 1771	WM	-	-	-	-	-	-	x	x	x
	Total		0	0	5	1	0	0	15	18	12

(225-256): Numbers within brackets after the common names are the numbers given to species in Ripley's (1982) Synopsis, which was also followed in Ali & Ripley's Handbook

(?) denotes the records of species from the site before the 2004 or reported by other workers at same site during same period

R: Resident; R/LM: Resident with Local Movement; LM: Local Movement; R/WM: Resident with Winter Movement; R/WM/LM: Resident with Winter as well as Local Movement; WM: Winter Migrant; WM/PM: Winter Migrant with Passage Migration; WM/R: Winter Migrant with Resident; SM: Summer Migrant

Table 3: Bird species of global importance recorded during study period (2004-2009) from urban habitats of Udaipur

Sr. No.	Common Name Scientific Name	Terrestrial Habitats						Aquatic Habitats		
		TPA	TPP	TFF	TAF	TIGS	TCA	WUL	WPUL	WOA
	Critically Endangered									
1	Red-headed Vulture (178) <i>Sarcogyps calvus</i> (Scopoli, 1786)	x	-	x	-	-	-	-	-	-
	Endangered									
2	Egyptian Vulture (186-187) <i>Neophron percnopterus</i> (Linnaeus, 1758)	x	-	x	x	x	x	-	-	-
	Vulnerable									
3	Dalmatian Pelican (22) <i>Pelecanus crispus</i> Bruch, 1832	-	-	-	-	-	-	x	x	-
4	Lesser Kestrel (221) <i>Falco naumanni</i> Fleischer, 1818	-	-	x	-	-	-	-	-	-
5	Sarus Crane (323-324) <i>Grus antigone</i> (Linnaeus, 1758)	-	-	-	x	-	-	-	x	-
6	Pied Tit or White-naped Tit (1798) <i>Parus nuchalis</i> Jerdon, 1844	x	-	x	-	-	-	-	-	-
	Near Threatened									
7	Darter (29) <i>Anhinga melanogaster</i> Pennant, 1769	-	-	-	-	-	-	x	x	-
8	Painted Stork (60) <i>Mycteria leucocephala</i> (Pennant, 1769)	-	-	-	-	-	-	x	x	-
9	Black-necked Stork (66) <i>Ephippiorhynchus asiaticus</i> (Latham, 1790)	-	-	-	-	-	-	-	x	-
10	Oriental White Ibis (69) <i>Threskiornis melanocephalus</i> (Latham, 1790)	-	-	-	x	-	-	x	x	x
11	Lesser Flamingo (74) <i>Phoenicopterus minor</i> (Geoffroy, 1798)	-	-	-	-	-	-	-	x	-
12	Ferruginous Pochard (109) <i>Aythya nyroca</i> (Guldenstadt, 1770)	-	-	-	-	-	-	x	x	-
13	Black-tailed Godwit (389-390) <i>Limosa limosa</i> (Linnaeus, 1758)	-	-	-	-	-	-	x	x	x
14	Black-bellied Tern (470) <i>Sterna acuticauda</i> J.E. Gray, 1831	-	-	-	-	-	-	x	x	-
15	European Roller (754) <i>Coracias garrulus</i> Linnaeus, 1758	-	-	x	x	x	-	-	-	-
	Total	3	-	5	4	2	1	7	10	2

Table 4: Assessment and rating of urban habitats of Udaipur

↓ Characteristics		Habitats →	Terrestrial Habitats					Aquatic Habitats		
		TPA	TPP	TFF	TAF	TIGS	TCA	WUL	WPUL	WOA
Bird Species	Terrestrial	118	84	136	91	92	59	0	0	0
	Aquatic	1	1	7	7	1	1	87	102	46
	Total	119	85	143	98	93	60	87	102	46
	Globally Threatened	3	0	5	4	2	1	7	10	2
Disturbance Level		1	2	1	2	2	3	2	1	2
Accessibility Level		1	1	1/3*	3	3	1	1	2	2
Importance Level	Local	3	1	2	2	2	1	1	3	3
	Global	1	3	3	3	3	3	1	1	3
Potential & Scope		1	2	1	2	3	3	1	1	2

(*) represents one of the sites, Khas Odhi, which is private property rich in terrestrial avifauna

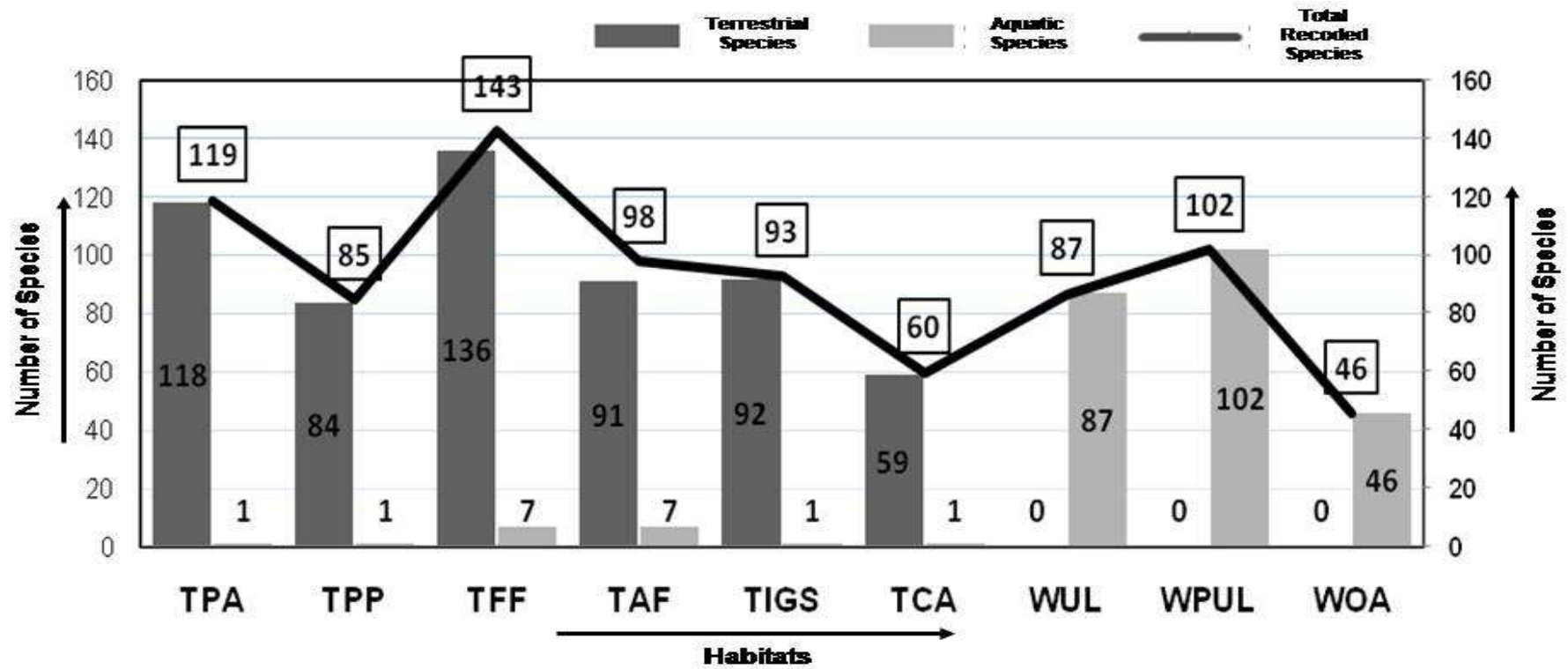


Fig. 1: Occurrence of Bird Species in urban habitats of Udaipur

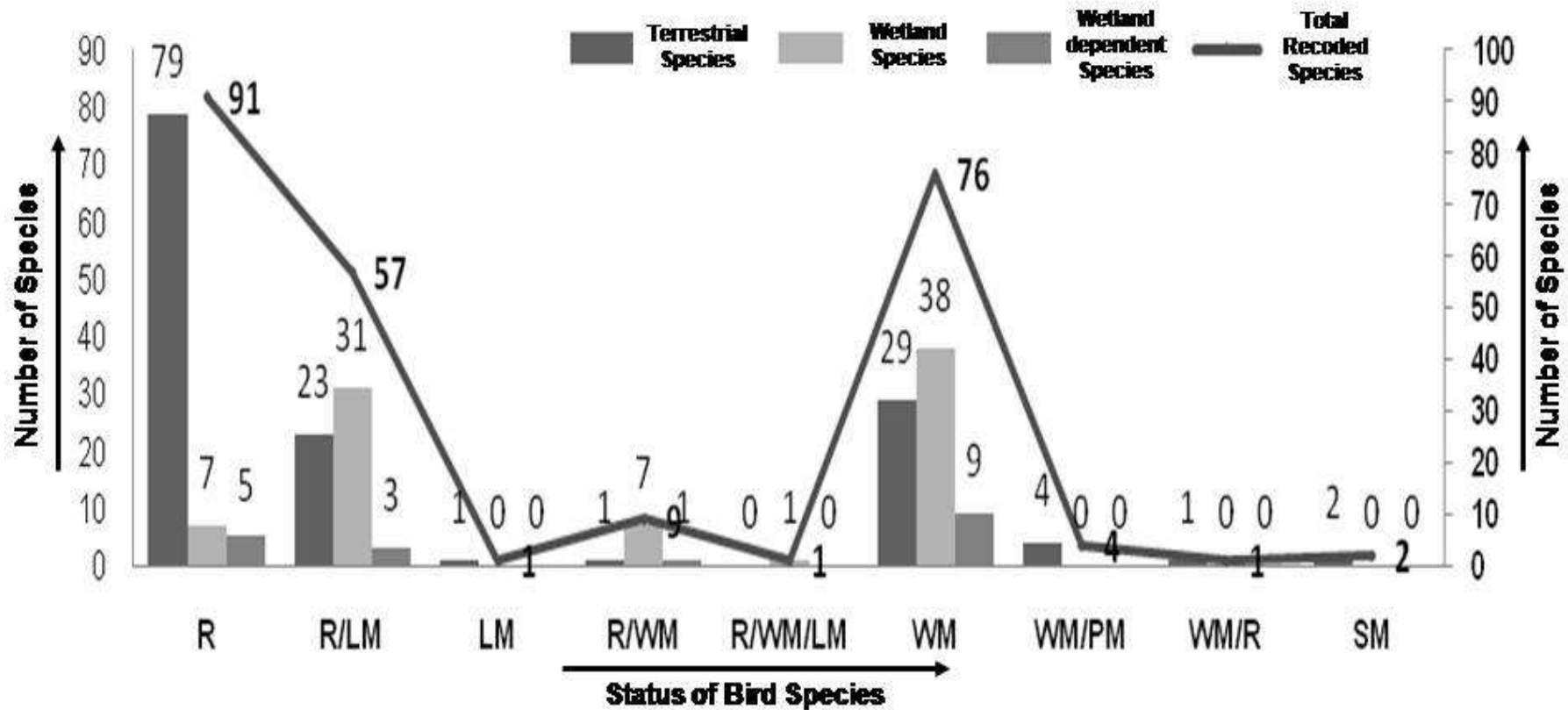


Fig. 2: Status of Bird Species recorded from urban habitats of Udaipur

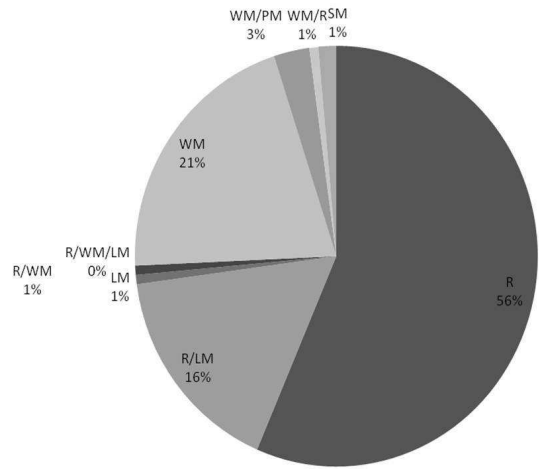


Fig. 3A: Status of terrestrial bird species

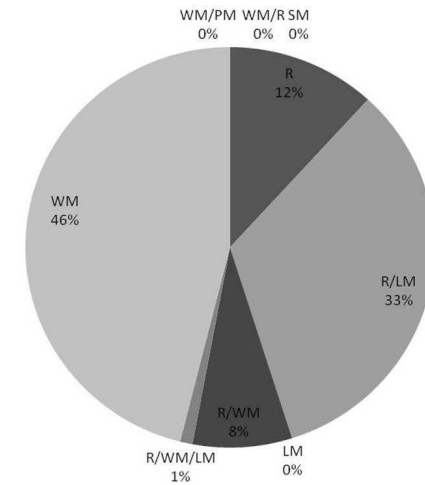


Fig. 3B: Status of aquatic bird species

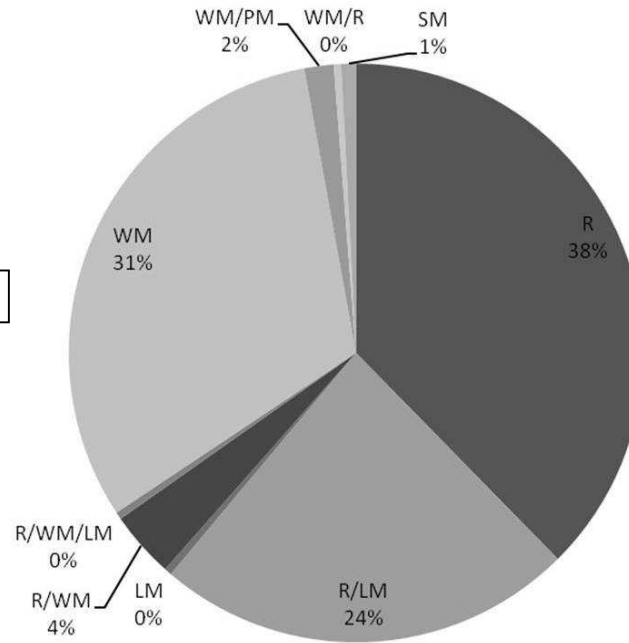


Fig. 3C: Status of recorded bird species

Fig. 3: Status of Bird Species in urban habitats of Udaipur