

## ROAD KILL MORTALITY OF BIRDS IN MOUNT ABU, RAJASTHAN

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### ABSTRACT

Roads are essential part for progress and it swiftly enables the movement of people. Other side it restricts the mobility of wild species, including birds, in their native habitat and leads to the death of wild animals on roadways as a result of vehicular collisions. The construction of road and highway networks within and around natural habitats is responsible for transforming extensive, undisturbed and large habitats into fragmented habitats with significant human interference. Frequent movement of vehicles on roads around wildlife sanctuary leads to the mortality of more birds as compared to other places. During the study, we observed that a total of 653 bird individuals belonging to 46 species and 22 families died due to road collisions from winter 2021 to monsoon 2023. Out of these, the maximum number of road killed individuals were observed in monsoon 2023 (211) followed by monsoon 2022 (181), summer 2023(91), summer 2022(72), winter 2021–22(56) and minimum number of road-killed bird individuals were found in winter 2022–23(42). The families Phasianidae and Columbidae had the highest number of road-killed species with 5 species from each family, followed by the family Sturnidae which had 4 species. Moreover, three bird families each have three species, seven bird families each have two species and the remaining nine bird families each have a single species that died due to collisions.

**Keywords:** Road, Bird, Habitat, Mortality, Vehicle, Collision

### INTRODUCTION

Roads play a crucial role in facilitating human transportation between different destinations by using vehicles. They limit the movement of animals in their natural habitats and result in the death of animals on roads due to collisions with vehicles (Forman and Alexander, 1998). Establishment of road and highway networks inside and surrounding of natural habitats such as wildlife sanctuaries and national parks is responsible for converting large intact natural habitats into fragmented habitats with high human intervention. Further fragmented habitat and traffic of vehicles influence the diversity and abundance of wild animals, including birds, due to death by road-vehicle collisions (Forman and Alexander, 1998; Santos *et al.*, 2022). Roads have a significant impact on the wildlife community in several ways, such as habitat loss and fragmentation, increased pollution and noise levels due to heavy rush of vehicles and an increased risk of wildlife mortality due to collisions with vehicles (Summers *et al.*, 2011). Road and highway network act as a barrier between two adjacent habitats and restrict the movement of wild organism, including amphibians, reptiles, birds and mammals (Develey and Stouffer, 2001; Goosem, 2001; Chishty *et al.*, 2020 and 2021; Choudhary and Chishty, 2020, 2021 and 2022). Therefore, the present study was carried out on the seasonal variation in bird mortality due to road-vehicle collisions in Mount Abu.

### MATERIALS AND METHODS

Present study was carried out from winter 2021 to monsoon 2023 to assess road kill bird mortality along the major and sub-connecting roads around Mount Abu, Sirohi district, Rajasthan. Every month, we

conducted regular roadside surveys using the line transect method and counted road kill birds using the direct observation method, identifying any bird carcasses found on the road. The study was carried out on the road with the help of a motorbike and photographs of road kill birds were taken with the help of a Nikon P1000 camera with a 125x optical zoom. Further road kill bird species were identified with the help of the standard field guide Bird of Rajasthan (Vyas, 2013) and Birds of the Indian Subcontinent (Grimmett *et al.*, 2011). No dead bird individuals were collected during the entire period of the study.

## RESULTS AND DISCUSSION

Various factors, such as the landscape and seasonal variation, play a crucial role in determining the availability of resources in the ecosystem. These factors affect diversity and abundance of animals, including birds in a particular area. As a result, occurrence of road kills can vary both seasonally and spatially (Erritzoe *et al.*, 2003; Keller and Yahner, 2007).

It was observed that a total of 653 bird individuals belonging to 46 species and 22 families died due to road vehicle collisions during the entire period of study (Winter 2021-22 to Monsoon 2023) (Table 1). Out of these, 309 individuals were observed during study period from winter 2021–22 to monsoon 2022 and 344 individuals during study period from winter 2022–23 to monsoon 2023 (Table 1). It was observed that maximum number of road-killed species belonged to the families Phasianidae and Columbidae (5 species from each family) followed by Sturnidae (4 species), Muscicapidae, Leiothrichidae and Corvidae (3 species from each family). Seven bird families, namely Ardeidae, Cuculidae, Hirundinidae, Motacillidae, Pycnonotidae, Rhipiduridae and Passeridae consisted of two species each killed in road vehicle collisions. Furthermore, of the remaining nine bird families, namely Accipitridae, Charadriidae, Strigidae, Caprimulgidae, Meropidae, Cisticolidae, Nectariniidae, Estrildidae and Dicruridae, only one species each died in the road vehicle collisions (Table 1).

A total of 309 road kill bird individuals were found from winter 2021–22 to monsoon 2022. Out of these, maximum number of road kill individuals were observed in monsoon 2022 (individuals =181; species=35) followed by summer 2022 (individuals =72; species =18) and minimum number of road kill bird individuals were observed in winter 2021–22(individuals=56; species=17). Subsequently, a similar pattern of bird mortality due to road vehicle collisions was also observed from winter 2022–23 to monsoon 2023. It was observed that a total of 344 bird individuals died due to road vehicle collisions. Out of these, maximum number of road kill bird individuals were observed during monsoon 2023 (individuals = 211; species = 39) followed by summer 2023 (individuals = 91; species = 25) and minimum number of road kill bird individuals were observed in winter 2022–23 (individuals = 42; species = 18) (Table 6.7).

Reason behind high bird mortality due to road vehicle collisions may be the heavy traffic. Mount Abu is the only single-hill station in Rajasthan State. Due to this, numerous domestic tourists visit Mount Abu every month or season. Furthermore, on Saturday and Sunday, a large number of tourists use to come from nearby state. A road also passes through the sanctuary area; due to this, birds frequently die due to road-vehicle collisions. In Mount Abu, tourist influx is higher in the monsoon and summer seasons as compared to the winter seasons. It was also the most probable reason for road-vehicle collisions and the high mortality of birds during the monsoon and summer seasons as compared to the winter season. Numerous factors, such as the characteristics of the environment, changes in seasons and availability of resources, have a significant impact on diversity and abundance of wild animals, including birds in a specific area (McCain, 2009; Katuwal *et al.*, 2016; Adhikari *et al.*, 2020; Pandey *et al.*, 2020). These factors also have a significant impact on the patterns of wild animals being killed in the road accident in a specific area (Erritzoe *et al.*, 2003; Keller and Yahner, 2007). Similarly, it was also found that higher bird mortality due to road killing occurred in the monsoon season followed by the summer and winter seasons. Numerous road lights are also present along the roadside. In early morning and late evening, several bird species, such as drongos, bee-eaters, robins and owls, forage around these lights for insects. In monsoon season, the weather becomes cloudier and visibility is very low. Due to this, these bird species are frequently killed by road-vehicle collisions in the monsoon season compared to other seasons. Boves

(2007) also concluded insectivorous and nocturnal bird species have behavior of seeking insects that are attracted by the light of vehicle headlights at night, which raises their susceptibility to collisions. It was observed that several bird species, such as House Crow, Large-billed Crow, Rufous Treepie, Greater Coucal, Shikra, Bank Myna, Oriental Megpie Robin, Spotted Dove and Red-vented Bulbul also forage and feed on feeding material such as remnant food material and carcasses of road-killed animals present on the road. At this time these bird species are frequently killed due to road vehicle collisions. Similar studies also conclude that scavenging raptors frequently die due to road vehicle collisions along the road (Dean and Milton, 2003; Husby and Husby, 2014). Furthermore, insect-eating bird species such as White-wagtail and Red-backed Shrike frequently killed by road vehicle collisions during the foraging time around road (Ceresa *et al.*, 2012; Husby and Husby, 2014). Insectivore species such as Jungle Nightjar, Asian Green Bee-eater, Wire-tailed Swallow, Barn Swallow, White-browed Wagtail, White wagtail, Indian Robin, Brown Rock Chat, Ashy Prinia, White-browed Fantail, White-spotted Fantail and Black Drongo mortality were also observed. Local and tourist throw grains, cereals and other food materials such as vegetable pieces, breads, cooked rice, popcorn and maize along the roadside. Granivore bird species usually feed on grains of cereal and millets, while omnivore species feed on grains, fruits and insects. Granivore and omnivore species such as Grey Francolin, Rain Quail, Rock Bush-quail, Aravalli Red-Spurfowl, Rock Pigeon, Laughing Dove, Eurasian Collared Dove, Red Turtle Dove, Common Babbler, Jungle Babbler, Large Grey Babbler, House Sparrow, Yellow-throated Sparrow, Brahminy Starling, Indian Pied Starling, Common Myna and Bank Myna were frequently sighted on the roads. Due to this, these bird species use to come towards the roadside for foraging and feeding. At this time, these birds are frequently hit by vehicles. Boves (2007) also made comparable observations and concluded that the birds are frequently dependent on roads for various purposes, such as foraging, scavenging and shelter. These bird species are more susceptible to collisions with vehicles as compared to other species. Passerines (Passeriformes) birds are most affected by road-vehicle collisions as compared to other species. A total of 46 road-killed bird species were observed; out of these, 27 bird species belong to Passeriformes order followed by Galliformes and Columbiformes (5 species each), Pelecaniformes and Cuculiformes (2 species each). Accipitriformes, Charadriiformes, Strigiformes, Camprimulgiformes and Coraciiformes were represented by single species that each died in road-vehicle collisions. According to Moller *et al.* (2011) traffic has a significant impact on the species that are most prevalent or abundant in a particular area.

**Table 1: List of bird species that died due to road-vehicle collisions in different seasons (W= winter season, S= summer season, M= monsoon season)**

S. no.	Name of bird species	Zoological name	Family	W2021-22	S2022	M2022	W2022-23	S2023	M2023	Total Individuals
1	Little Egret	<i>Egretta garzetta</i>	Ardeidae	0	0	1	1	0	3	5
2	Indian Pond Heron	<i>Ardeola grayii</i>	Ardeidae	0	0	0	0	0	4	4
3	Shikra	<i>Accipiter badius</i>	Accipitridae	2	3	6	0	0	3	14
4	Grey Francolin	<i>Ortygornis pondicerianus</i>	Phasianidae	0	0	4	1	0	4	9
5	Rain Quail	<i>Coturnix coromandelica</i>	Phasianidae	0	0	0	0	0	1	1

6	Rock Bush-quail	<i>Perdicula argoondah</i>	Phasianidae	0	0	3	0	0	3	6
7	Jungle Bush-quail	<i>Perdicula asiatica</i>	Phasianidae	0	1	4	1	0	2	8
8	Aravalli Red-Spurfowl	<i>Galloperdix spadicea caurina</i>	Phasianidae	0	2	6	0	0	0	8
9	Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae	2	7	5	1	9	4	28
10	Rock Pigeon	<i>Columba livia</i>	Columbidae	3	0	2	3	5	2	15
11	Laughing Dove	<i>Spilopelia senegalensis</i>	Columbidae	5	7	10	3	4	11	40
12	Spotted Dove	<i>Spilopelia suratensis</i>	Columbidae	0	0	1	2	1	4	8
13	Eurasian Collared-dove	<i>Streptopelia decaocto</i>	Columbidae	1	0	2	0	3	1	7
14	Red Turtle-dove	<i>Streptopelia tranquebarica</i>	Columbidae	0	1	0	0	0	0	1
15	Asian Koel	<i>Eudynamys scolopaceus</i>	Cuculidae	0	0	3	0	1	2	6
16	Greater Coucal	<i>Centropus sinensis</i>	Cuculidae	1	2	5	0	2	11	21
17	Spotted Owlet	<i>Athene brama</i>	Strigidae	0	1	3	0	0	0	4
18	Jungle Nightjar	<i>Caprimulgus indicus</i>	Caprimulgidae	0	0	0	0	0	3	3
19	Asian Green Bee-eater	<i>Merops orientalis</i>	Meropidae	0	0	2	0	0	3	5
20	Wire-tailed Swallow	<i>Hirundo smithii</i>	Hirundinidae	3	0	0	1	2	6	12
21	Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	1	0	0	0	0	0	1
22	White browned Wagtail	<i>Motacilla maderaspatensis</i>	Motacillidae	0	0	8	3	0	2	13
23	White Wagtail	<i>Motacilla alba</i>	Motacillidae	0	0	0	4	0	0	4
24	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	14	17	21	7	23	37	119
25	White-eared Bulbul	<i>Pycnonotus leucotis</i>	Pycnonotidae	0	0	2	0	2	3	7
26	Oriental Magpie Robin	<i>Copsychus saularis</i>	Muscicapidae	2	6	11	0	2	5	26
27	Indian Robin	<i>Copsychus fulicatus</i>	Muscicapidae	3	2	8	1	4	10	28
28	Brown Rockchat	<i>Oenanthe fusca</i>	Muscicapidae	0	0	5	0	1	0	6

29	Common Babbler	<i>Argya caudata</i>	Leiothrichidae	2	4	9	1	2	7	25
30	Jungle Babbler	<i>Argya striata</i>	Leiothrichidae	0	0	3	0	2	5	10
31	Large Grey Babbler	<i>Argya malcolmi</i>	Leiothrichidae	0	1	2	1	2	7	13
32	Ashy Prinia	<i>Prinia socialis</i>	Cisticolidae	0	0	2	1	1	3	7
33	White-browed Fantail	<i>Rhipidura aureola</i>	Rhipiduridae	0	0	4	2	3	5	14
34	White-spotted Fantail	<i>Rhipidura albogularis</i>	Rhipiduridae	0	0	2	0	2	4	8
35	Purple Sunbird	<i>Leptocoma zeylonica</i>	Nectariniidae	3	1	6	0	2	6	18
36	Indian Silverbill	<i>Euodice malabarica</i>	Estrildidae	0	0	3	0	2	5	10
37	House Sparrow	<i>Passer domesticus</i>	Passeridae	7	6	12	7	9	16	57
38	Yellow-throated Sparrow	<i>Gymnoris xanthocollis</i>	Passeridae	0	0	4	0	0	7	11
39	Brahminy Starling	<i>Sturnia pagodarum</i>	Sturnidae	3	7	11	2	4	7	34
40	Indian Pied Starling	<i>Gracupica contra</i>	Sturnidae	0	0	3	0	0	2	5
41	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	2	1	5	0	0	2	10
42	Bank Myna	<i>Acridotheres ginginianus</i>	Sturnidae	2	0	0	0	1	0	3
43	Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae	0	0	3	0	2	3	8
44	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Corvidae	0	0	0	0	0	3	3
45	House Crow	<i>Corvus splendens</i>	Corvidae	0	3	0	0	0	4	7
46	Large-billed Crow	<i>Corvus macrorhynchos</i>	Corvidae	0	0	0	0	0	1	1
<b>Total number of bird individuals died in road-vehicle collisions</b>				<b>56</b>	<b>72</b>	<b>181</b>	<b>42</b>	<b>91</b>	<b>211</b>	<b>653</b>



**Figure 1- Road kill of Aravalli Red-Spurfowl**



**Figure 2- Road kill of Red-vented Bulbul**



**Figure 3- Road kill of Greater Coucal**



**Figure 4- Road kill of Rock Pigeon**

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