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## A study on animal-vehicle collision in Bhavnagar city and nearby area, Gujarat, India

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### Abstract

Present work carried out to study the animal-vehicle collisions on the roads of Bhavnagar city and adjoining areas. During 2014-15, 35 animal species have reported dead due to vehicle collisions, among them two amphibians, 12 reptiles, 9 birds, and 12 mammals. Collision victim animals like Striped Hyena and Red send Boa categorized under Near Threatened and Indian soft shell turtle under vulnerable category by IUCN. Highest, 104 collision reported during the month of August' 2015 and lowest during May, February month of '15 and November' 14.

**Keywords:** Animal-vehicle collision, Bhavnagar city, Gujarat, IUCN

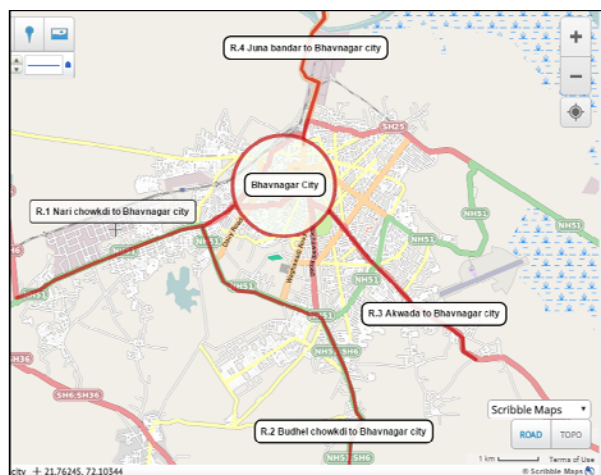
### 1. Introduction

Bhavnagar is the fifth largest city following Ahmedabad, Surat, Vadodara, and Rajkot cities of Gujarat state, India. Bhavnagar has a city area of about 54.14 km<sup>2</sup> and population is about 6, 50,882 (2011).<sup>[33]</sup> It bears a man-made reserved forest, Victoria Park, and a Black buck National park, Velavadar situated 54 km from the city area and many wetlands around the city. These protected areas and few wild patches with thorny plants and grassy plains serve suitable niches to the wild animals as well as domestic animals. Human population and their development in the city area is increasing day by day, their developmental activities have reached to fragment the wildlife area, by dividing them into separate parts, these activities may kill the wild and domestic animals<sup>[28, 10]</sup>. Animal-vehicle collisions affect common as well as threatened animal populations<sup>[7]</sup>. Animals are killed during crossing roads through different vehicles e.g., Bikes, Truck, motor vehicles, buses. The reasons behind crossing the roads are logical. Few of them are crossing roads in search of grazing ground. Reptiles may habitually cross roads as they hunt, scatter from their natal sites, migrate among seasonal habitats, moves for the mating purposes. Snakes are nocturnal, devoid of limbs hence slow in locomotion, they become victim of road accidents<sup>[2, 18]</sup>. Domestic animals like pig and dogs lives in rural area, their presence on road are Universal. Monsoon and winter are the seasons when more dogs victimized compare to summer. Fresh water terrapins become victim of road kill while they were in search of fresh water sources for it. Birds like Crows, mynas and cattle egrets seen to eat insects from the cow dung and human food waste on the road. Greater coucal, crow Pigeon, Babblers, Sparrows, and Prinias smashed during nearest flights to the heavy vehicles. Present case study displaying animal-vehicle collision in Bhavnagar city and nearby area with animal IUCN status and numerous affects of these collisions on society health.

### 2. Material and Method

#### 2.1 Study Area

Bhavnagar (21.77°N 72.15°E) is located on the eastern coast of Saurashtra, Gujarat. Four main city connected roads selected as a study area of Bhavnagar. The first road (R1) is from Nari Chowkdi to Bhavnagar city (10 km) (21.74923°N 72.13546°E) second (R2) is Budhel Chowkdi to Bhavnagar city (7 km) (21.72755°N 72.15657°E) third (R3) is Akwada village to Bhavnagar city (15 km) (21.74222°N 72.17803°E) and fourth (R4) is Juna bandar to Bhavnagar city (4 km) (21.79342°N 72.14898°E) (Fig.1).



**Fig 1:** Map showing selected roads to Bhavnagar city and adjoining area.

**2.2 Methods**

The study has carried out during period of a year November 2014 to October 2015. Monthly four to five visits taken using bike or cycle on selected roads of Bhavnagar city and adjoining areas (Fig.1), early morning and evening time chosen for count and photography of victimized animals. List of collision victim animals was prepared along with their IUCN status following websites IUCN and India Biodiversity Portal. For identification, we have used several field guides [5, 12, 15] and internet resources. Photographic plate was prepared; photos of Indian toad, Skink, Indian rock pigeon, Cattle egret, House crow, House sparrow, Indian Pariah Dog, Pig, Domestic Cat, Indian Gerbil and Indian palm Squirrel were avoided due to low quality images.

**3. Results and Discussion**

Total 194 collisions reported during the year of November

2014 to October 2015. Four classes namely amphibians, reptilia, birds, and mammalian fauna taken into the account as they exhibit considerable number on the road. Total 35 animal species were recorded among them two amphibians, 12 reptiles, 9 birds and 12 mammals were reported (Table 1). Throughout the year mammals (52%), reptiles (31%), Birds (11%) and Amphibians (06%) have reported as dead due vehicular accidents (Fig.2). Seasonally highest animal-vehicle collision in monsoon (56%) while in winter (26%) and lowest summer (18%) was recorded (Fig.1). Dogs, snakes, and Garden Lizard killed highest on road. During monsoon season amphibians and reptiles killed more than other animals, mammals got accident throughout the year. Highest accidents were seen on R2 and R4 road and lowest on R1 road.

In the world, many authors have worked on mortality of mammals [19, 8, 20, 24] to birds [23, 8, 17] reptiles [8, 11, 6] amphibian [31, 30, 6, 26]. Various authors have documented the literature on collision of animals with vehicles on the roads e.g., [13, 29]. Roads are dangerous to small mammals, reptiles, amphibians that are affected by their habitat fragmentations [1, 3, 9, 14]. India Chhangani 2004 [4] and Selvanet *et al.*, 2012 [25] estimated the animal kills on the roads of Karnataka and Rajasthan respectively. In Gujarat, various authors have been worked on road accidents [7, 27, 16, 30].

In a short report we have focused on some animals, there may be plenty other victims, which is killed on the road. In nature, each individual plays an important role in food chain to sustain environmental balance. Animal-vehicle collisions may control the population of domestic animals but it makes numerous effects on society health. Firstly the dead bodies of big mammals cause traffic as well as the inter vehicle accidents. Vehicle of Bhavnagar Municipal Corporation (BMC) removing dead bodies from the road (R1) Fig 4(18). These dead bodies smell intolerably, if any individual get prolong contact defiantly it affects health headache, nausea, vomiting are the common symptoms.

**Table 1:** List of victims of animal-vehicle collision, year 2014-15

Animal class	No	Animal scientific name	Common name	IUCN Status
Amphibians	1	<i>Duttaphrynus melanostictus</i> (Schneider, 1799)	Asian common Toad	LC
	2	<i>Euphyctis hexadactylus</i> (Lesson, 1834)	Green Pond Frog	LC
Reptiles	3	<i>Calotes versicolor</i> (Daudin, 1802)	Oriental Garden Lizard	LC
	4	<i>Lygosoma punctata</i> (Gmelin 1799)	Skink	NE
	5	<i>Varanus bengalensis</i> (Daudin, 1802)	Indian Monitor	LC
	6	<i>Nilssononia gangetica</i> (Cuvier, 1825)	Indian soft shell turtle	VU
	7	<i>Naja naja</i> (Linnaeus, 1758)	Spectacle Cobra	NE
	8	<i>Dendrelaphis tristis</i> (Daudin, 1803)	Bronzback Tree Snake	NE
	9	<i>Bungarus caeruleus</i> (Schneider, 1801)	Common Indian Krait	NE
	10	<i>Ptyas mucosa</i> (Linnaeus, 1758)	Indian Rat snake	NE
	11	<i>Coelognathus helena</i> (Daudin, 1803)	Common Trinket Snake	LC
	12	<i>Lycodon aulicus</i> (Linnaeus, 1758)	Common Wolf snake	LC
	13	<i>Eryx johnii</i> (Russell, 1801)	Red send Boa	NT
	14	<i>Xenochrophis piscator</i> (Schneider, 1799)	Checkered Kill back	NE
	Birds	15	<i>Centropus sinensis</i> (Stephens, 1815)	Greater Coucal
16		<i>Vanellus indicus</i> (Boddaert, 1783)	Red-wattled lapwing	LC
17		<i>Turdoides striata</i> (Dumont, 1823)	Jungle Babbler	LC
18		<i>Columba livia</i> (Gmelin, 1789)	Indian rock pigeon	LC
19		<i>Prinia inornata</i> (Sykes, 1832)	Plain prinia	LC
20		<i>Bubulcus ibis</i> (Linnaeus, 1758)	Cattle Egret	LC
21		<i>Corvus splendens</i> (Vieillot, 1817)	House Crow	LC
22		<i>Acridotheres ginginianus</i> (Latham, 1790)	Bank Myna	LC
23		<i>Passer domesticus</i> (Linnaeus, 1758)	House Sparrow	LC
Mammals	24	<i>Canis lupus familiaris</i> (Linnaeus, 1758)	Indian Pariah Dog	LC
	25	<i>Sus Sp.</i>	Indian Pig	LC
	26	<i>Asinus Sp.</i> ( Geddes, 1988)	Donkey	LC

27	<i>Herpestes edwardsii</i> (Geoffroy Saint-Hilaire, 1818)	Indian grey Mongooses	LC
28	<i>Viverricula indica</i> (Geoffroy Saint-Hilaire, 1803)	Indian civet	LC
29	<i>Felis chaus</i> (Schreber, 1777)	Jungle Cat	LC
30	<i>Felis Sp.</i> (Linnaeus, 1758)	Domestic Cat	LC
31	<i>Hystrix indica</i> (Kerr, 1792)	Indian crested Porcupine	LC
32	<i>Boselaphus tragocamelus</i> (Pallas, 1766)	Nilgai	LC
33	<i>Hyaena Hyaena</i> (Linnaeus, 1758)	Striped Hyena	NT
34	<i>Tatera indica</i> (Hardwicke, 1807)	Indian Gerbil	LC
35	<i>Funambulus palmarum</i> (Linnaeus, 1766)	Indian palm Squirrel	LC

Abbreviations: LC- Least Concern, VU- Vulnerable, NE- Not Evaluated, NT, Near Threatened

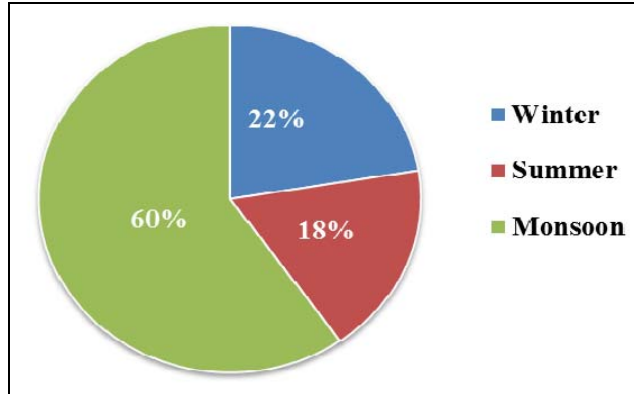


Fig 2: Animal mortality in particular season due to vehicle collision

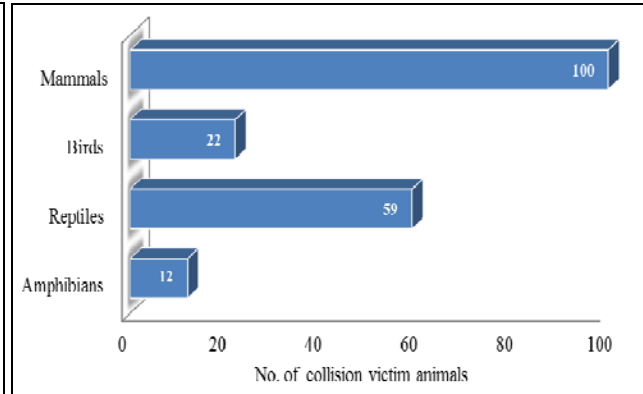


Fig 3: Class wise animal mortality year 2014-15

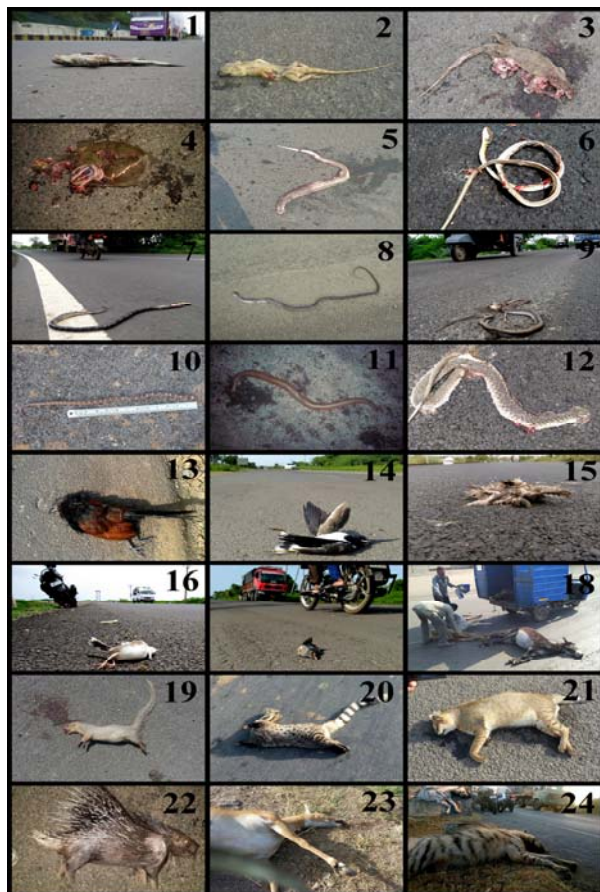


Fig 4: Photos of victim animals reported on Bhavnagar city and its adjoin roads. 1. Indian Pond Frog 2. Oriental Garden Lizard 3. Monitor Lizard 4. Indian soft shell turtle 5. Spectacle Cobra 6. Bronzback Tree Snake 7. Common Indian Krait 8. Indian Rat sand 9. Common Trinket Snake 10. Common Wolf snake 11. Red sand boa 12. Checkered Kill back 13. Greater Coucal 14. Red-wattled lapwing 15. Jungle Babbler 16. Plain wren-warbler 17. Bank Myna 18. Donkey 19. Indian grey Mongoose 20. Indian Civet Cat 21. Jungle Cat 22. Indian crested Porcupine 23. Nilgai 24. Striped Hyena

4. Conclusions

Animal get victim of road accident in all seasons but particularly more in monsoon when they shows their great diversity and abundance. There may numerous reasons for presence of animals on road but the reasons behind collisions were lacking of awareness of animal importance and violation of traffic rule regarding vehicle speed. Reptile collision can avoided by making tunnels in roads, while big animal collision can be prevented by using Road side animal detection system (RADS).

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