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A STUDY BASED ON THE SURVEY OF LEPIDOPTERA VICTIMS ON ROAD KILLS IN COIMBATORE, (TN) INDIA

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ABSTRACT

We examined the spatial patterns and factors influencing Lepidoptera aggregations of road-kill in the foot hill of Marudhamalai, Coimbatore, Southern India. We surveyed roads varying in high traffic volume, configuration and adjacent landscape attributes for road-kills between Jan 2010 – December 2010. In the present study is to assess the level of mortality and factors from road kills of the study area. The five species namely, *Danaus chrysippus* (Linnaeus), *Danaus plexippus* (Cramer) *Tirumala limniac*(Cramer), *Pachliopta hector* (Linnaeus) and *Pachliopta aristolochiae* (Fabricius) were analyzed high frequencies of road-kills Apparently associated with reproductive behavior, temperature, and carrion or roadside vegetation which attract Lepidoptera to roads and increase their vulnerability to highway mortality.

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INTRODUCTION

During the 21st century, road kills became common in all industrialized countries, as they adopted the internal combustion engine in automobiles. In India, for example, there was an eight-fold increase in the total length of roads (from 0.399 to 3.38 million km) and 100- fold increase in the number of motorized vehicles (from 0.3 to 30 million, with a growth of ~12% per annum) in the last 50 years (1951–2004) (www.indiacore.com). Highways across wildlife refuges are an intrusive condition that affects the wildlife and forest habitats adversely (Baskaran and Boominathan 2010). Marudhamalai hills and its adjoining areas of the Western Ghats are highly disturbed due to the human intervention and it can also create a barrier to the movement of nearly 10,000 to 50,000 people. Casualty ranges were high in Lepidopteran species, but research on wildlife road casualties and ecology were limited, the existing literature was largely focused on mostly higher vertebrates (Aresco 2005; Waring *et al.* 1991). The study was carried out between Jan 2010 to December 2010, to evaluate the impact of vehicular traffic on Lepidoptera in terms of animals killed by road accidents. In the present study, it is noted that the casualties of road traffic of the study area is related to mortality and it is the most visible evidence to illustrate the direct effect that the roads have on wildlife. Roads serve as an obstacle for maintaining ecological connectivity and viable wildlife populations (Bennett 1991, Forman *et al.* 2003).The barrier or fragmentation effects of roads result when animals within populations are unable to approach or cross roads to connect habitats,

access mates or meet other biological requirements (Clevenger and Kociolek 2006). The poor nutritional condition and reproductive behavior may also a reason for the butterflies to travel from one place to another, which lead the animal victimized by road traffic.

MATERIALS AND METHODS

Marudhamalai hill and Bharathiar University are located in the Coimbatore district of Tamil Nadu, South India at an elevation of 410m altitude above Mean Sea Level (MSL). It is geographically located at 76° 52' 44.46'' E longitude and 11° 02' 24.38'' N latitude and elevated 1614 ft above MSL. Temperature was recorded as, 20° to 22°C (November to January) and 28° to 30°C (February to June). The area comprised around 15 km road way that includes hill way and plains of about 3000 acres. The survey analysis were taken into account on direct impact of butterflies at road side and the road kill butterflies were counted from two different road ways by periodic transect survey and opportunistic sampling methods. The overall counting were systematically calculated during the month of Jan 2010 to Dec 2010 at twice per day [6.30 to 8.00AM and 5.00 to 6.30 PM (Indian time)] and at every sighting of a road kill, the information such as, place, species name and status of the road killed were recorded.

RESULTS

A check list was prepared based on the survey of road killed butterflies in Marudhamalai region (Temple area) and adjoining areas of Bharathiar University resulted in a total number of 109 road kills belonging to 5 species

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(frequent killed butterflies: *Danaus chrysippus* (Linnaeus), *Danaus plexippus* (Cramer), *Tirumala limniace* (Cramer), *Pachliopta hector* (Linnaeus), *Pachliopta aristolochiae* (Fabricius) (Table 1).

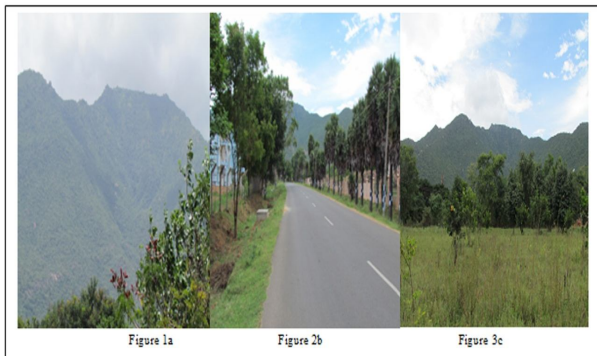


Fig- 1a, 1b, 1c: Study area covered during the excrement
 1a. Marudhamalai Hill (Forest region)
 1b. Road way
 1c. Bharathiar University (Shaded region)

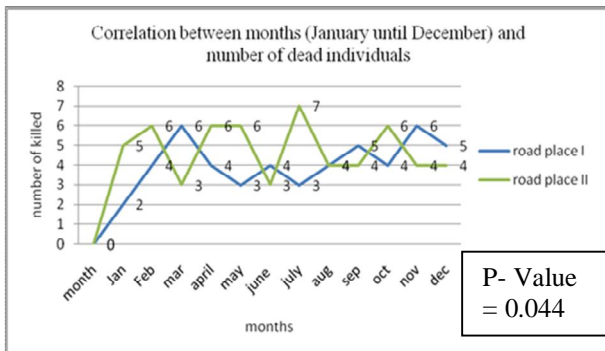


Fig- 2a: Correlation between months (January until December) and number of dead individuals (tested with linear regression)

The analysis was recorded both by periodic transect survey and opportunistic sampling methods (Fig- 2a). Diversity attributes were calculated with analysis of variance between Marudhamalai hill and Bharathiar university road ways and butterfly road kills are 50:59 /109 (fig- 2b).

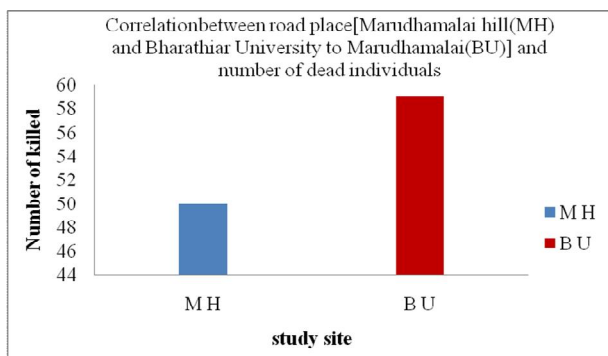


Fig-2b: Correlation between road place (Marudhamalai hill and Bharathiar University to Marudhamalai) and number of dead individuals (tested variance)

During the study period, among 109 individual road kills, *Danaus* and *Pachliopta* were the most affected species (almost 41:42 individuals/109) up to the period of one

year and number of dead individuals were tested with analysis of variance P- Value 0.440, Standard Error : 0.12463 (Fig-2c). The total number of kills in group level was recorded (Table: 2). It is interesting to note that, among five species of road killed butterflies all the species is identified as male individuals except three.

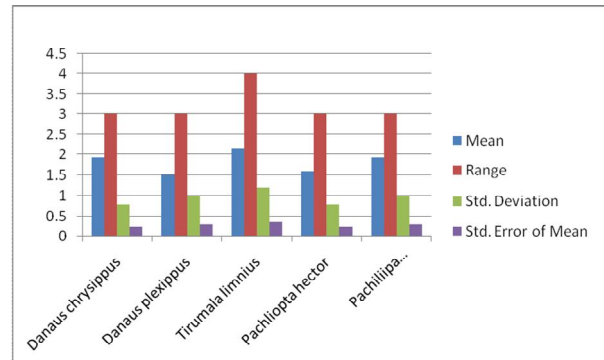


Fig – 2c: Possible Difference in the number of dead individual by species (Tested variance)

DISCUSSION

The data on road kills revealed that vehicular traffic killed a minimum of 180 individuals of vertebrate fauna amphibian, reptile, bird and mammals of the reserve in four months (Baskaran and Boominathan 2010). During the study area almost 109 individuals only butterfly's fauna were survived and most of dead animal was taken in to Bharathiar University to Marudhamalai hill zone. During reproductive season (November to December and March to May) a trend of migration from one direction to other was noted (Number of death is similar to all month (fig 2a). The males prefer to locate mates in the shade and respond more readily to shaded females. The possible reasons for this includes that, the shaded females are more visible to the males when staying in the shade. This is due to the richness of UV in the shade which significantly enhances the UV reflection of female wings (Yoshiaki Obara *et al.* 2008). Newly emerged virgin females stay for few hours on the underside of leaves, where they are shaded from direct sunlight (Hirota *et al.* 2001). Temperature may attract the butterflies during mating season; it leads to the migration in the butterflies towards road side. Based on the survey it is noted that the butterflies diversity were rich in Marudhamalai hill and adjoining areas during the study period (Fig-2b, 2c). Most of the temples in Tamil Nadu are ancient with enormous space and have their own *Nanthavanams* (Temple Garden) where apart from *Sthalavriksha* species a number of other plants also available that attract large number of butterflies to the temple premises. A total number of 52 species of butterflies belonging to five families were recorded (Gunasekaran and Balasubramanian, 2010). In Common Mormon (*Papilio polytes*), this difference is not high, but in Danaid Eggfly (*Hypolimnas misippus*) and Plain Tiger (*Danaus chrysippus*), the number of male road kills is significantly higher (Shyama Prasad Rao *et al.* 2007). In the present findings most of them are male butterflies that were killed in road ways; especially

Table 1 correlation between numbers of killed in species level for throughout the year

Species	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Danaus chrysippus	12	1.9167	.79296	.22891	1.4128	2.4205	.00	3.00
Danaus plexippus	12	1.5000	1.00000	.28868	.8646	2.1354	.00	3.00
Tirumala limnius	12	2.1667	1.19342	.34451	1.4084	2.9249	.00	4.00
Pachliopta hector	12	1.5833	.79296	.22891	1.0795	2.0872	.00	3.00
Pachiliipa aristolochiae	12	1.9167	.99620	.28758	1.2837	2.5496	.00	3.00
Total	60	1.8167	.96536	.12463	1.5673	2.0660	.00	4.00

Table 2 correlation between the killed in group level

Groups level	Sum of Squares	df	Mean Square	F	Significance
Between Groups	3.567	4	.892	954	.440
Within Groups	51.417	55	.935		
Total	54.983	59			

Bharathiar University zone is high. The present findings concluded that most road kills by vehicles are healthy individuals, sexually active animals which have implications for management of local populations. Nonetheless three species *Danaus* and two species *Pachliopta* were recorded during the study area. These two species and can be highly attracted by temperature during the reproductive season.

CONCLUSION

The data of the present study illustrated the road killed mortality of the lepidopteran species in the Marudhamalai hills and Bharathiar University areas. This may be hypothetically based on the reasons such as migration, food scarcity, reproductive behavior etc. From the results it is evident that male butterflies are highly influenced by temperature conditions that lead them to migrate across roadways to find their mate and fall as victims through accidents. Ultimately, this leads to the threat in the male butterfly population.

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