

Distribution and Abundance of Wildlife Roadkills in Jengka, Pahang, Peninsular Malaysia

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Abstract Malaysia's growing transportation network has increased human impact on wildlife habitats, causing a rise in roadkill cases. This study aims to assess the distribution and abundance of roadkill in Jengka, Pahang. Surveys along selected roads for ten days in March 2022 recorded 72 incidents (0.36 roadkill km⁻¹). The water monitor (*Varanus salvator*) was the most frequently recorded species with 12 incidents, while the least frequently recorded species, each with 1 incident, included the monocled cobra (*Naja kaouthia*) and the house rat (*Rattus rattus*). Species of particular concern based on the International Union for Conservation of Nature (IUCN) Red List Categories included the long-tailed macaque (*Macaca fascicularis*) (Endangered), clouded monitor lizard (*Varanus nebulosus*) (Near Threatened), and Malayan flat-shelled turtle (*Notochelys platynota*) (Vulnerable). Main Federal Roads, particularly Jalan Bukit Tajau - Bandar Pusat Jengka (FT62) and Jalan Utama Jengka Utara/Selatan (FT83), had notable roadkill rates of 0.73 and 0.35 per kilometer, respectively. Jalan FELDA 25 (FT1553), linking Bandar Tun Abdul Razak to Jerantut and Kuala Krau, recorded the highest rate at 0.78 roadkill per kilometer, highlighting the need for attention. Proposed actions include wildlife crossings, wildlife warning reflectors and wildlife warning signs in hotspots, and table drains alongside roads. It is also essential to educate drivers on the importance of reducing speed, especially in wildlife crossing zones, to minimize incidents. These findings stress the importance of proactive measures in reducing roadkill and safeguarding wildlife in Jengka, urging collaborative efforts to enhance road safety for both humans and animals.

Keywords: Roadkill, road-ecology, road-infrastructure, wildlife-vehicle collision.

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Introduction

Conflicts between humans and wildlife resulting from vehicle collisions have been the subject of research spanning a broad taxonomic spectrum [4, 13]. For three decades, road ecology has highlighted how roads and its' users can harm biodiversity and wildlife populations [23, 38]. The significant development of Malaysia's transport infrastructure has exerted anthropogenic pressures on wildlife habitats leading to a high incidence of roadkill [27]. The clearance of forest areas is needed to accommodate the development of the road. As the habitat diminishes, wildlife is forced to move in search of crucial resources such as shelter, water, and food. These movements increase the likelihood of wildlife-vehicle collisions (WVC). Other factors contributing to the incidence of roadkill include the presence of animal carcasses resulting from previous incidents [16] and the disposal of food from vehicles, which attract wildlife to the road [12]. Wildlife populations can be adversely affected both directly and indirectly by the presence of roads. Direct harm occurs when vehicles collide with animals, leading to fatalities. Indirect harm arises when roads act as barriers to animal movement, disrupting their natural movement patterns, access to resources, and overall habitat connectivity. The dual impact of roadways can lead to significant

long-term ecological consequences [30, 36]. Some authors estimate that the incidence of roadkill may surpass that of natural mortality rates in certain populations [15], which could lead to a potential impact on population density [14, 20]. Roads and its' traffic can be viewed as a new threat to wildlife. Unlike established predators, the dangers posed by roads and vehicles are entirely new and unexpected to wildlife. As a result, wildlife does not develop any adaptations or strategies needed to avoid collisions such as change their movement patterns to stay safe from traffic. This lack of evolutionary preparation leaves them particularly vulnerable to the dangers of roads, leading to increased mortality and will further affect the population long-term viability [19, 42].

Studies from Peninsular Malaysia highlight roadkill cases involving endangered species such as the flat-headed cat (*Prionailurus planiceps*) and Malayan tapir (*Tapirus indicus*), along with other mammals, birds, and reptile species [21, 22]. A prior study also documented 305 roadkill instances encompassing 24 species on highways in the states of Terengganu and Pahang [19]. In terms of roadkill involving Malayan tapirs, Pahang holds the second-highest record with 26 incidents, following Terengganu with 33 roadkills [22]. These incidents were recorded across diverse habitats, including rainforests, oil palm plantations, subsistence agricultural lands, and village areas. Several roadkill studies have also been conducted in Jengka, Pahang, revealing the following percentages for various species: Asian palm civet (27.41%), leopard cat (14.51%), large Indian civet and barn owl (9.61% each), clouded monitor lizard (8.06%), long-tailed macaque and wild boar (6.45% each), monitor lizard (4.83%), greater coucal, oriental honey buzzard and red junglefowl (3.22% each), and white-breasted waterhen (1.61%) [24, 25].

Bandar Tun Abdul Razak (Jengka Town: 3°46'12"N 102°32'45"E) is categorised as a semi-urban area, which has witnessed significant developments in terms of services and facilities. It is surrounded by crucial habitats such as oil palm plantations and forest reserves such as Tengku Hassan Wildlife Reserve in Temerloh and National Park in Jerantut that support a diverse range of wildlife species. The intermittent expansion of Bandar Tun Abdul Razak and the launching of the new East Coast Expressway have led to a significant increase in traffic. This surge in traffic has resulted in roadkill incidents, as animals need to cross the road in search of food for survival [25]. The expansion of roads in Jengka is vital to enhance convenience for traffic users, providing easy access for the community. However, this development threatens wildlife habitats and is expected to increase roadkill incidents in the area.

Despite extensive research on wildlife roadkill in Peninsular Malaysia, there is a notable lack of studies focused on semi-urban areas. This gap in research hampers our understanding of roadkill incidents in these areas, making it difficult to address the negative impacts of road development on wildlife populations. Without targeted research and effective mitigation strategies, there is a risk that road expansion could lead to the extinction of certain species. This study thus intends to emphasise the human-wildlife conflict as a result of transportation development in Jengka, Pahang by determining the distribution and abundance of wildlife roadkills in that area.

Materials and Methods

Study Area

The Jengka Cluster, also recognized as Wilayah Jengka, is situated in the state of Pahang Darul Makmur and stands as the largest Federal Land Development Authority (FELDA) cluster in Malaysia. Referred as Jengka Triangle due to its strategic location, it spans three districts: Temerloh, Jerantut, and Maran. Covering an expansive area of approximately 64,117.05 ha, Wilayah Jengka encompasses residential zones, along with oil palm and rubber plantations. In recent decades, its town center (Bandar Tun Abdul Razak) has transformed into a semi-urban area, featuring numerous residential areas to cater the needs of its 25,000 residents. The landscape of Wilayah Jengka features significant FELDA settlements such as FELDA Sungai Nerek, FELDA Sungai Tekam, FELDA Ulu Jempol, and FELDA Lepar Utara, as well as essential forest reserves that sustain local biodiversity. These FELDA settlements act as buffers, protecting the forest reserves by shielding the natural habitats from human activities.

The sampling location was situated on the major roads of Bandar Tun Abdul Razak (Figure 1), a town established approximately 30 years ago. Notably, this town experiences substantial traffic, particularly during peak hours on weekdays [37]. Located 53 km from Temerloh, 55 km from Maran, and 127 km from Kuantan, Bandar Tun Abdul Razak is surrounded by diverse landscapes, including housing areas, main roads, oil palm plantations, economic zones, and forests.

According to the list of Federal Roads published by the Ministry of Works, three of the selected roads were categorised as Main Federal Roads (with route numbers between 1 and 221), and seven were categorised as FELDA Federal Roads (with route numbers between 1000 and 2748) [49]. Only one of the selected roads was categorised as a non-Federal Road. Main Federal Roads are major interurban routes that connect state capitals and lead to points of entry and exit from the country, thus experiencing

heavier traffic. In contrast, FELDA Federal Roads are located in FELDA settlements and are primarily used by the small community of FELDA residents, resulting in lower traffic volumes [49]. The selected Main Federal Roads for conducting roadkill surveys were Jalan Utama Jengka Utara/Selatan (FT83), Jalan Maran-Benta (FT64), and Jalan Bukit Tajau - Bandar Pusat Jengka (FT62). Additionally, surveys were conducted on FELDA Federal Roads, including Jalan Utama Jengka 8, 9, 12, 13 (FT1534), Jalan Jengka 25 (FT1553), Jalan Utama Jengka 1-10 (FT1536), Jalan Utama Jengka Utara/Timur (FT1537), Jalan Ulu Jempol (FT1531), Jalan Jengka Utara/Barat (FT1533), and Jalan Jengka 1 (FT1542). The non-Federal Road chosen as a sampling location was Jalan Rantas Kuala Sentul (Table 1).

Table 1. The selected roads for roadkill surveys in Jengka, Pahang

Symbol	Road Name	Road Number	Length (km)
A	Jalan Maran-Benta	64	50
B	Jalan Utama Jengka 1-10	1536	11
C	Jalan Jengka 1	1542	8
D	Jalan Ulu Jempol	1531	7
E	Jalan Utama Jengka Utara/Timur	1537	3
F	Jalan Bukit Tajau - Bandar Pusat Jengka	62	30
G	Jalan Rantas Kuala Sentul	-	3
H	Jalan Utama Jengka Utara/Selatan	83	40
I	Jalan Jengka 25	1553	9
J	Jalan Utama Jengka 8, 9, 12, 13	1534	36
K	Jalan Utama Jengka Utara/Barat	1533	3
Total			200

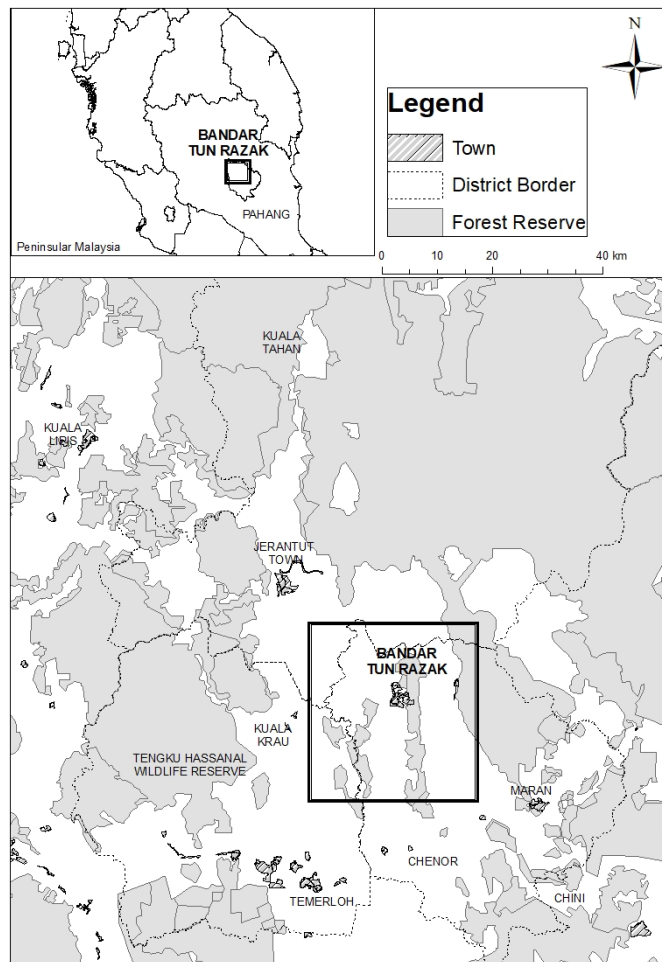


Figure 1. Location of Bandar Tun Abdul Razak, Pahang

Data Collection and Species Identification

The surveys were conducted over a period of 10 days in March 2022, with two sessions daily from 8 a.m. to 11 a.m. and from 4 p.m. to 7 p.m. The survey approach involved driving a car along the 11 selected roads at a speed of 50 km/h to systematically search for any wildlife carcasses on the road [40]. Upon discovering a roadkill, each instance was documented by capturing the images. Relevant information, including date and time, species, the potential cause of death, location, road name, and surrounding vegetation were recorded. The carcasses were subsequently relocated to the roadside to avoid data duplication. All specimens found dead on the road during the surveys were noted as having been killed by vehicle collisions.

The coordinates of the roadkill locations were obtained using a handheld Global Positioning System (GPS) device. Species identification was carried out by referring to Francis (2008), Robson (2014), Seng *et al.* (2020) and Abdullah *et al.* (2022).

Results and Discussion

Species Composition and Abundance of Roadkills on The Selected Roads in Jengka

A total of 72 individuals (0.36 roadkill km⁻¹) were examined during the surveys, constituting 62 wildlife individuals across 17 species (Table 3). Out of the identified species, seven were reptiles (45.16%), five were mammals (35.48%), four were aves (17.74%), and one was an amphibian (1.61%). These species represented 16 families, with Varanidae emerging as the most common. The significant occurrence of roadkill among reptiles and mammals is attributed to their larger size, making them more noticeable compared to amphibians, which registered the lowest number. Identifying dead mammals is also easier due to their larger sizes compared to other groups of wildlife [9, 28]. Challenges arise in accurately counting and identifying species of frogs and lizards during surveys, as smaller species are easily overlooked and misidentified [7].

Roadkill is suggested as one of the main factors influencing the decrease in wildlife populations, underscoring the importance of roadkill studies [10]. Nonetheless, there exists the possibility that certain wildlife struck by vehicles were not documented, as they could have fled the scene after the incident. Additionally, other casualties may have been eliminated by weather conditions or scavengers [32]. These considerations indicate that the actual percentage of wildlife roadkill might be higher than what is reflected in the recorded data.

The most common identified wildlife included: water monitor (*Varanus salvator*) n=12, plantain squirrel (*Callosciurus notatus*) n=11, Asian palm civet (*Paradoxurus hermaphroditus*) n=7, red junglefowl (*Gallus gallus*) n=6, reticulated python (*Malayopython reticulatus*) n=4, rice paddy snake (*Hypsiscopus plumbea*) and clouded monitor lizard (*Varanus nebulosus*) n=4. Other wildlife identified were barn owl (*Tyto alba*) n=3, copper-head rat snake (*Coelognathus radiatus*) and long-tailed macaque (*Macaca fascicularis*) n=2 as well as monocled cobra (*Naja kaouthia*), white-throated kingfisher (*Halcyon smyrnensis*), Eurasian tree-sparrow (*Passer montanus*), Asian common toad (*Duttaphrynus melanostictus*), Malayan flat-shelled turtle (*Notochelys platynota*), common treeshrew (*Tupaia glis*), and house rat (*Rattus rattus*) n=1. Notably, *M. fascicularis* is classified as Endangered (EN) on the International Union for Conservation of Nature (IUCN) Red List, *N. platynotana* is classified as Vulnerable (VU), and *V. nebulosus* falls under the category of Near Threatened (NT). Additionally, there were four unidentified individuals and six domestic species, including cats n=3, dogs n=2, and rabbit n=1.

This data indicates that larger wildlife, such as *V. salvator* and *P. hermaphroditus* may face a higher risk of road accidents while crossing roads, whereas species with elevated extinction risks are less likely to be encountered as roadkill due to their rarity. Monitor lizards are habitat generalists that breed throughout the year and have wide home range especially in tropical areas, thus they are abundant and could contribute to high roadkill count for this species [15, 43]. Besides, they are active foragers and usually covers a long distance for foraging activity [44]. Greater movements and road crossings due to isolated habitats, could cause these animals to be more frequently killed by roads [45]. Meanwhile, *P. hermaphroditus* frequently use gravel roads and roadside forests at night to find their food plants and defecate [46], thus making them easily to be killed on roads especially during nighttime. A prior study also indicated a positive correlation between body size and the number of road fatalities, while there was a negative correlation with the extinction threat category [8]. Arboreal species like *M. fascicularis* and aerial species such as *H. smyrnensis* are less prone to WVC, attributed to their tendency to avoid the ground. Despite being frequently observed foraging along roadsides [47], *M. fascicularis* exhibited a low

rate of roadkill in this study, likely due to their quick reflexes to approaching vehicles. Research suggests that macaques have developed strategic navigation skills to balance food acquisition near roads with risk avoidance [48]. Primate can adjust their behaviour based on the perceived risks of road injuries, such as waiting longer to cross wider roads and extending their wait times as traffic volume increases [48]. These behavioural adjustments help macaques reduce the risk of vehicle collisions.

This study also highlights an increase in the occurrence of roadkilled snakes on Jengka roads when compared to prior roadkill studies [24, 25]. This difference can be attributed to the selected roads' locations, which cut through plantations and forests supporting a significant snake population and dispersal activity [39].

Table 2. The number of roadkill incidence recorded on the selected roads in Jengka, Pahang

Symbol	Road Name	Number of Incidence (%)
A	Jalan Maran-Benta	2 (3.2)
B	Jalan Utama Jengka 1-10	3 (4.8)
C	Jalan Jengka 1	0 (0)
D	Jalan Ulu Jempol	0 (0)
E	Jalan Utama Jengka Utara/Timur	1 (1.6)
F	Jalan Bukit Tajau - Bandar Pusat Jengka	22 (35.5)
G	Jalan Rantas Kuala Sentul	0 (0)
H	Jalan Utama Jengka Utara/Selatan	14 (22.6)
I	Jalan Jengka 25	7 (11.3)
J	Jalan Utama Jengka 8, 9, 12, 13	12 (19.4)
K	Jalan Utama Jengka Utara/Barat	1 (1.6)
Total		62

Table 3. List and abundance of roadkill species recorded in Jengka, Pahang

No	Class / Family	Species	Common name	IUCN status	Abundance (Relative abundance)
AMPHIBIA					
1	Bufo	<i>Duttaphrynus melanostictus</i>	Asian Common Toad	LC	1 (1.61%)
AVES					
2	Alcedinidae	<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	LC	1 (1.61%)
3	Phasianidae	<i>Gallus gallus</i>	Red Junglefowl	LC	6 (9.68%)
4	Passeridae	<i>Passer montanus</i>	Eurasian Tree Sparrow	LC	1 (1.61%)
5	Tytonidae	<i>Tyto alba</i>	Common Barn Owl	LC	3 (4.84%)
MAMMALIA					
6	Viverridae	<i>Paradoxurus hermaphroditus</i>	Asian Palm Civet	LC	7 (11.29%)
7	Cercopithecidae	<i>Macaca fascicularis</i>	Long-Tailed Macaque	EN	2 (3.21%)
8	Muridae	<i>Rattus rattus</i>	House Rat	LC	1 (1.61%)
9	Sciuridae	<i>Callosciurus notatus</i>	Plantain Squirrel	LC	11 (17.74%)
10	Tupaiaidae	<i>Tupaia glis</i>	Common Treeshrew	LC	1 (1.61%)
REPTILIA					
11	Varanidae	<i>Varanus nebulosus</i>	Clouded Monitor Lizard	NT	4 (6.45%)
12	Varanidae	<i>Varanus salvator</i>	Common Water Monitor	LC	12 (19.35%)
13	Colubridae	<i>Coelognathus radiatus</i>	Copper-head Trinket Snake	LC	2 (3.21%)
14	Elapidae	<i>Naja kaouthia</i>	Monocled Cobra	LC	1 (1.61%)
15	Pythonidae	<i>Malayopython reticulatus</i>	Reticulated Pythons	LC	4 (6.45%)
16	Homolopsidae	<i>Hypsiglena plumbea</i>	Rice Paddy Snake	LC	4 (6.45%)
17	Bataguridae	<i>Notochelys platynota</i>	Malayan Flat-Shelled Turtle	VU	4 (6.45%)
				Total	62 (100%)

Note. IUCN Status; LC= Least Concern, VU= Vulnerable, NT= Near Threatened, EN=Endangered

Distribution of Roadkills in Jengka

Road F (Jalan Bukit Tajau - Bandar Pusat Jengka) reported the highest incidence of roadkill with a total of 22 occurrences ($0.73 \text{ roadkill km}^{-1}$), followed by Road H (Jalan Utama Jengka Utara/Selatan) with 14 ($0.35 \text{ roadkill km}^{-1}$) instances, and Road J (Jalan Utama Jengka 8, 9, 12, 13) with 12 roadkill incidents ($0.33 \text{ roadkill km}^{-1}$) during the entire sampling period. Road I (Jalan Jengka 25) also registered a relatively higher number of roadkill incidents, totalling seven ($0.78 \text{ roadkill km}^{-1}$) compared to other roads such as Road B (Jalan Utama Jengka 1-10), which recorded three roadkills ($0.27 \text{ roadkill km}^{-1}$), Road A (Jalan Maran-Benta) with two roadkills ($0.04 \text{ roadkill km}^{-1}$), and Roads E (Jalan Utama Jengka Utara/Timur) and K (Jalan Utama Jengka Utara/Barat) each reporting only one roadkill ($0.33 \text{ roadkill km}^{-1}$ each). The remaining roads (Road C: Jalan Jengka 1, Road D: Jalan Ulu Jempol, and Road G: Jalan Rantas Kuala Sentul) did not register any roadkill incidents (Table 2).

Both Road F and H belong to the Main Federal Roads and serve as significant interurban roads connecting state capitals. On Road F, a total of nine reptiles, nine mammals, and four bird species were observed, while Road H recorded six bird species, five reptiles, and three mammals. Road F plays a crucial role in Jengka by linking FELDA settlements like Jengka 2, 3, and 5 to Bandar Tun Abdul Razak, while Road H connects FELDA settlements such as Jengka 8, 11, 15, 16, 17, 18, and 19 to Bandar Tun Abdul Razak. Due to their connection between FELDA settlements and the main town, both roads experience heavier traffic compared to other roads in Jengka, resulting in a higher incidence of roadkills [50]. This study also uncovers a significant number of roadkill incidents along Road I, a FELDA Federal Road that also serves as a connection to the nearest towns including Bandar Tun Abdul Razak, Kuala Krau and Jerantut. On the other hand, Road C, Road D, and Road G did not have any instances of roadkill documented. These roads fall under the category of FELDA Federal Roads, experiencing less traffic compared to other selected roads [49]. The relatively shorter length of these roads ($<10 \text{ km}$) was another factor contributing to the absence of recorded roadkill incidents.

Additional factors leading to the elevated roadkill rates on Road F and Road H include its trajectory through the oil palm plantation, a crucial wildlife habitat [29]. Despite extensive land clearance for major developments like Bandar Tun Abdul Razak and FELDA settlements along these roads, the high number of roadkill reported in this study indicates that a significant abundance and diversity of animal species continue to inhabit the area.

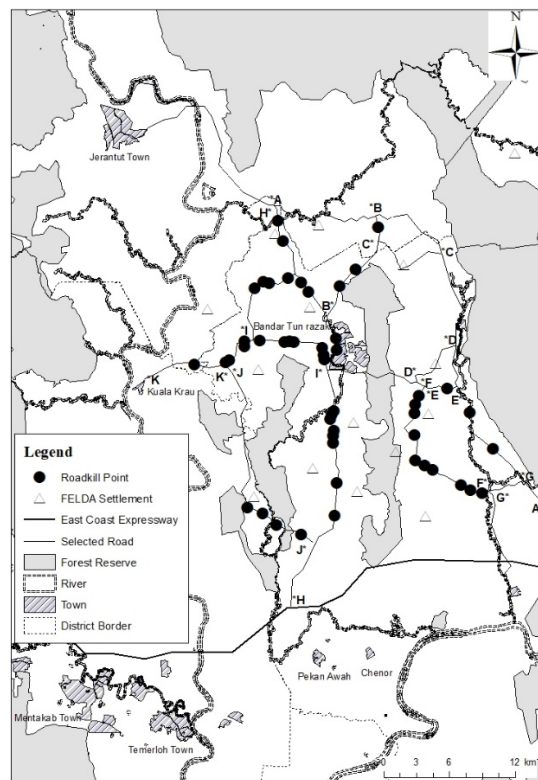


Figure 2. Distribution of roadkills on each selected road in Jengka, Pahang

A previous study found that the majority of roadkill incidents occurred in rural settings along straight roads, particularly on paved roads close to plantation areas [6]. This description aligns with the characteristics of the surveyed roads where roadkill wildlife was documented in this study. The majority of roadkill specimens were discovered on straight roads situated near oil palm and rubber plantations, surrounded by areas with thick vegetation or secondary forests. This is attributed to the fact that these areas provide a favorable habitat and effective shelter for wildlife [29]. The presence of bushes and secondary forests offers effective cover, ensuring protection for the wildlife and its offspring [24]. Additionally, oil palm plantations contribute significantly to the availability of sufficient food for the survival of wildlife [29]. Nonetheless, this study documented a greater occurrence of roadkill incidents on roads in semi-urban settings with higher traffic volumes rather than those in rural areas. Notably, this study incidentally recorded one specimen outside the selected roads, particularly on Jalan Lintasan Semarak, Bandar Tun Abdul Razak (3°45'50"N 102°32'47"E).

Mitigation Measures to Prevent Wildlife-Vehicle Collisions in Jengka

The morning survey documented a higher occurrence of roadkill incidents, indicating that such WVC might take place at dawn or midnight. Some bodies were found in a better condition than those identified in the evening survey due to the lower traffic at night. The condition of the bodies also suggests that the roadkill likely occurred within a time frame of two to six hours. This aligns with a prior study that highlighted a higher incidence during these times [6, 46]. Night-time driving is widely acknowledged to limit a driver's visibility of wildlife, primarily due to the restricted lighting range and the less contrasting appearance of many native species against typically dark road surfaces [3]. Installing wildlife warning reflectors (WWRs) alongside wildlife warning signs (WWSs) in areas with frequent roadkill may help reduce such incidents [51]. WWRs function by reflecting vehicle headlights, which discourages animals from approaching the road at night. The combination of WWRs and WWSs should provide an additional alert for drivers to reduce their speed in wildlife hotspots [22, 24].

Another proposed measure to mitigate the risk of roadkill in Jengka, Pahang involves installing table drains, particularly in areas with narrow roads or where the pavement is close to abundant vegetation. A table drain functions as a drainage system positioned alongside a road, collecting runoff water and diverting it away from the road's surface [26]. The implementation of table drains along roads is expected to improve water flow, diminish water pooling near the street, and subsequently decrease the growth of vegetation. This, in turn, would reduce the availability of water that attracts wildlife to the roadside. Considering that the majority of recorded roadkill incidents in Jengka occurred along roads with nearby vegetation, it is recommended to implement this approach as a crucial step in preventing wildlife from consuming stagnant water on the roadside and, consequently, reducing roadkill occurrences.

Numerous studies have indicated that the majority of wildlife species make use of wildlife crossings [2, 18]. In addition, many countries have successfully implemented these facilities, resulting in a notable reduction in road mortality [35]. In Malaysia, several wildlife crossings have been designed and built to facilitate the movement of animals [22]. A previous study conducted in Terengganu, Malaysia, also emphasized the effectiveness of viaducts in decreasing roadkill incidents involving large mammals [40]. The establishment of wildlife crossings can therefore play a crucial role in restoring landscape permeability within the fragmented habitat networks in Jengka. When planning for a wildlife crossing it is crucial to take into account additional factors, such as diversifying the types and sizes of crossings. This ensures that the majority of the local population can avail themselves of these crossings [5].

To effectively reduce WVCs, prioritising driver education and strict adherence to speed regulations is essential. Research shows that most traffic users agree that driver behaviour, such as using a mobile phone while driving and exceeding speed limits, greatly contributes to road accidents in Jengka [52]. Educating drivers on the need to reduce speed, especially in wildlife crossing areas, is crucial for minimizing these incidents. Additionally, enforcing speed limits and considering lower speeds during nighttime can further mitigate the risk of wildlife collisions [53]. This study thus recommends installing WWRs and WWSs at Jalan Jengka 25 where the highest rate of roadkill per kilometer was recorded, to help reduce roadkill incidents in the area.

Conclusions

To conclude, this research sheds light on the significant impact of roadkill incidents on wildlife populations in Jengka, Pahang. The data revealed that 72 individuals across various species were affected by roadkill, highlighting the pressing need to address this issue. Furthermore, specific roads, especially Main Federal Roads and Jalan Jengka 25 experienced higher incidences of roadkill, indicating

the necessity for targeted interventions in these areas. This study recommends constructing wildlife crossings, installing WWRs and WWSs in hotspots, and implementing table drains alongside roads. It is also essential to educate drivers on the importance of reducing speed, especially in wildlife crossing zones, to minimize incidents. Enforcing speed limits and considering reduced speeds during nighttime can further decrease the risk of wildlife collisions. This study emphasises the critical role of proactive measures in mitigating roadkill and safeguarding wildlife populations in Jengka. By implementing targeted interventions and considering the unique ecological characteristics of the region, stakeholders can strive towards creating safer road environments for both wildlife and humans.

Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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