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Araştırma Makalesi / Research Article

Motorized Vehicle – Bird Collisions on the Highway Surrounding Lake Van (Turkey)

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Abstract

This study investigated vehicle–bird accidents over the highway surrounding Lake Van. Observations were made between November 2015 and October 2016 on the 430 km road.

As a result, dead bodies of 297 birds from 28 species were found, and the rate was calculated as 21 bird/km/year. The highest death rate found in the study was that of *Corvus frugilegus* (Rook) by 80 individuals (26.93%). This was followed by *Larus armenicus* (Armenian gull) by 40 individuals (13.46%), *Melanocorypha calandra* (Calandra lark) by 37 individuals (12.45%), *Corvus monedula* (Jackdaw) by 33 individuals (11.11%), *Sturnus vulgaris* (Starling) by 26 individuals (8.75%), and *Passer domesticus* (House sparrow) by 12 individuals (4.37%).

It was observed that accidents increased in areas close to the main road. Additionally, it was seen that young individuals who just started to fly experienced accidents more frequently.

Key words: Birds, Road mortality, Collusion, Traffic, Highway, Road casualties

Van Gölü'nü Çevreleyen Karayolunda Motorlu Araç – Kuş Çarpışmaları

Özet

Bu araştırmada Van Gölü'nü çepeçevre saran karayolunda meydana gelen kuş-araç kazaları üzerinde duruldu. Gözlemler Kasım 2015 – Ekim 2016 tarihleri arasında 430 km'lik yolda gerçekleştirildi.

Araştırma neticesinde yoldan toplamda 28 türe ait 297 kuş ölüsü tespit edildi ve sonuç 21 kuş/km/yıl olarak hesaplandı. Çalışmada yolda araç çarpması sonucu ölen kuşlar arasında 80 (% 26.93) birey ile *Corvus frugilegus* (Rook) en yüksek oldu. Bunu 40 (% 13.46) birey ile *Larus armenicus* (Armenian gull), 37 (% 12.45) birey ile *Melanocorypha calandra* (Calandra lark), 33 (% 11.11) birey ile *Corvus monedula* (Jackdaw), 26 (% 8.75) birey ile *Sturnus vulgaris* (Starling) ve 13 (% 4.37) birey ile *Passer domesticus* (House sparrow) takip etti.

Kazaların yola yakın kesimlerde arttığı gözlendi. Ayrıca yeni uçmaya başlayan genç bireylerin daha fazla kazaya uğramış oldukları görüldü.

Anahtar Kelimeler: Kuşlar, Yol ölüm oranları, Çarpışma, Trafik, Karayolu, Yol kayıpları

Introduction

Birds and other animals are damaged by various anthropogenic factors. Transportation networks also have an important place among such factors nowadays. Highways directly or indirectly affect birds in a negative way. Finding injured or dead birds on the roads is a frequent sight, though undesirable. This study investigates vehicle – bird collisions on the highway surrounding Lake Van.

Lake Van is the largest alkaline lake in the world. It is also the largest lake in Turkey. Its altitude is 1646 meters. Its deepest point is 451 meters deep, while the average depth is known as 171 meters. It has surface area of 3713 km^2. The lake is ornithologically very significant. It has various habitats for birds to live (Anonymous, 2016).

Schoenemann (1977) reported that nocturnal bird species are negatively affected by head lights. They suggested that head light most probably stun these species completely.

Bergmann (1974) studied weather and bird accidents. They reported that accidents involving birds have a much lower frequency in windy and rainy weather than hot weather. They explain this by drivers' need to adjust their speed in bad weather conditions.

Another debate about road inspection and data collection is the discussion on collecting data on foot, on a bicycle or in a car. Hodson and Snow (1965) and Havlin (1987) reported that the highest amount of data can be collected on foot, followed by on bike and via car in order.

Hansen (1982), Bashta (1999) and Joselyn et al. (1969) revealed the relationship between characteristics of roads and bird accidents. They also focused on the speed of vehicles, amount of traffic and bird deaths.

In Wascher et al.'s study (1988), it was reported that accidents rarely happen up to a speed of 40 km/h. The same study suggested that accidents start at a speed of 56 km/h.

Bosch (1989) and Johnson (1989) reported on the relationship between bird habitats around roads and bird accidents.

Different methods are used to determine the birds dying on highways. There is not standardization in terms of method. Some researchers have conducted their studies every day on a certain road length, while some other did so a few times a day, once in every two days or in specific seasons during the year. The most notable of these may be listed as Bergmann (1974), Bereszynski (1980) and Wascher et al. (1988).

Hansen (1969) indicated a relationship between bird accidents and behavior of birds. They said the risk of accidents is increased by the fact that some birds fly slower than others. Masson and Mac Donald (1995) reported in their study that hawks, red kites and seagulls feed on garbage and carcasses. They said that these birds land on road for this reason and become victims of accidents. Göransson et al. (1978) stated that sparrow usually live around residential areas and farms, but they fly to agricultural lands around for feeding. They emphasized that sparrows which must cross the road for feeding experience accidents.

Erritzoe et al. (2003) focused on bird accidents on European roads in their collective study. They reported that an estimated number of between 350 thousand and 27 million birds die in some European countries as a result of collisions with cars. They also included monthly distribution of birds, birds' age and sex, as well as the issues in methodology. Their study also contained the information that mostly ousels and sparrows

in Western Europe, and crows, swallows in addition to sparrows in Central – Eastern Europe take part in the highest numbers of accidents.

Coffin (2007) stated that transportation infrastructure has a direct influence on natural ecosystems. They focus on the effects on the structure, function and species composition of the ecosystem. They stated that this negative influence resulted in the emergence of a new scientific field names as "road ecology".

Brockie et al. (2009) studied road accidents with wild animals in a longitudinal study spread within the years 1984, 1994 and 2005 in New Zealand. They reported that bird deaths increased in parallel to the density of vehicles on the roads of the island.

Aslan et al. (2009) stated that 26 injured birds were brought to their clinic between 2006 and 2008 in the Lake Van Basin. They indicated that most of the birds brought there were of predatory species. They declared fire arms and car collisions as most important reasons for injury.

George et al. (2011) focused on mammal deaths due to car collisions. The main subject of their study was the hypothesis they provided. Their hypothesis was that there is a correlation between the abundance of mammalian species living close to the road and the number of accidents. They meant that the increases and decreases of population may be monitored by analyzing the relationship between these two phenomena.

Kociolek et al. (2011), in their collection study, focused on the effects of road networks on bird population. They categorized these effects as direct and indirect. They listed the direct effects as loss of habitat due to road construction, pollution, poisoning and car collisions. The listed physical barrier, noise pollution, artificial lights and boundary effects among the indirect.

Ivanona et al. (2012) compared the dead animals they collected for a year in certain lengths of the Marmara highway and the Class I highway between Pazarcık and Filibe. They concluded that mostly birds die in the Marmara highway and mostly amphibians die in the Class I highway. They found the rate as 36 animals/km/year for all animals.

Rosa and Bager (2012), in their study for two federal highways in Brazil, calculated the rate of bird deaths due to collision with cars as 0.06 individual/km/day. They also reported that birds experience more accidents near rice fields and wetlands. They also said bird accidents are denser in summer and fall.

Uysal et al. (2012), in their year-long analysis on the highway between Çanakkale and Lapseki, found 18 dead Barn owls (*Tyto alba*) among other bird species. The researchers suggested that night lighting may create benefits by reducing the effects of head lights in places where owl deaths are frequent.

Kiziroğlu et al. (2013) focused on Turkey's biodiversity and threats. They reported basic threat titles as intervention with wetlands and water regimes, solid waste, mining activities, wind energy risks, losses in highways, electricity transfer lines, air traffic risks, road construction, dam and hydraulic power plant construction, illegal hunting, habitat disruption, faulty irrigation, forest disruption and stubble burning. They reported that animal accidents on highways increased with vehicles going faster by the increased number of vehicles and length of roads. Bird death rate was given in the study as 27 birds/km/year in Turkey. Sharma (1988) reported this rate as 44 individuals for India.

Loss et al. (2014) interpreted bird death rates they derived from 13 studies in the United States. In the study, they estimated the yearly number of birds dying as a result of collision with cars as 89 – 340 million.

Method

This study was conducted on the highway surrounding Lake Van with the approximate length of 430 km. The road subject to study has four lanes. The maximum speed limit outside residential areas is 110 km/h. The study was conducted between November 2015 and October 2016, and lasted for a year. The lake was circled with a car once every month and data were collected. A total of 12 observations were made. The average speed was 70 km/h, to easily see the birds. At least three people except the driver made observations to check the front, right and left sides of the road. GPS coordinates of all cases were recorded. The cases were investigated in terms of species, sex and approximate age. The results were analyzed as birds/km/year.

Findings

As a result of the study, a total of 297 dead birds from 28 species were found on the road (See Table 1). Accordingly, 297 : 12 = 24.75 x 365 = 9.033.75 : 430 = 21 birds/km/year. The highest death rate found in the study was that of *Corvus frugilegus* (Rook) by 80 individuals (26.93%). This was followed by *Larus armenicus* (Armenian gull) by 40 individuals (13.46%), *Melanocorypha calandra* (Calandra lark) by 37 individuals (12.45%), *Corvus monedula* (Jackdaw) by 33 individuals (11.11%), *Sturnus vulgaris* (Starling) by 26 individuals (8.75%), and *Passer domesticus* (House sparrow) by 12 individuals (4.37%).

As the data show, *Corvus frugilegus* (Rook) and *Corvus monedula* (Jackdaw) deaths were recorded for almost all monthly observations. However, accident rates of both species reach their maximum in August and September. A similar situation was seen in the species *Larus armenicus* (Armenian gull). *Sturnus vulgaris* (Starling) reached the highest rate in September. On the other hand, *Melanocorypha calandra* (Calandra lark) was recorded only in winter months (See Figure 1). As Table 1 shows, the highest number of accidents in the study area was recorded in September. This month was followed in order by August, January, February and March.

It was found that 53 of the 80 individuals of *Corvus frugilegus* (Rook) (66.25%), 27 of the 40 individuals of *Larus armenicus*'un (Armenian gull) (67.5%) and 19 of the 33 individuals of *Corvus monedula* (Jackdaw) (57.57%) collected in the study were young individuals that started flying only recently.

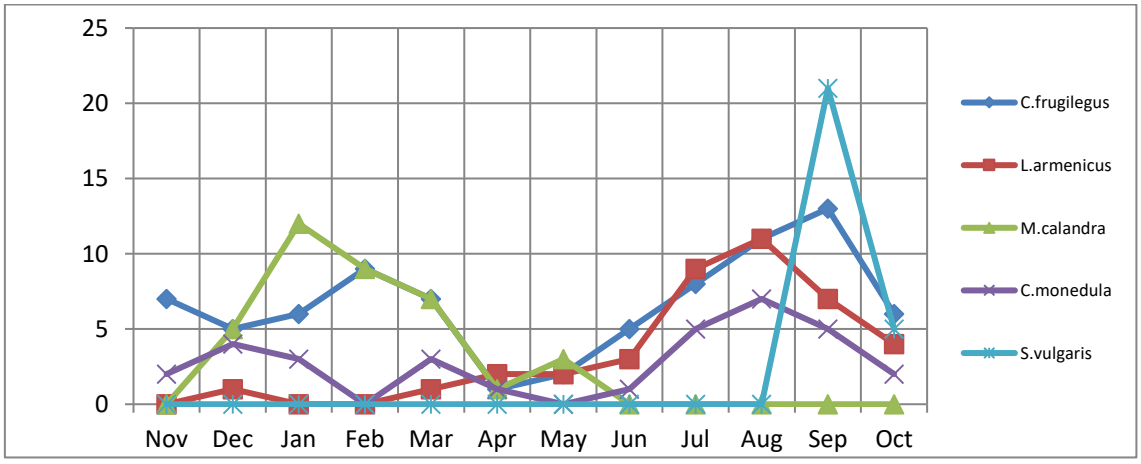

Figure 1. Monthly distribution of 5 species that had the most accidents

Table 1. Species data found in the study

Observation Date / **Species**	**15 Nov 2015**	**14 Dec 2015**	**15 Jan 2016**	**21 Feb 2016**	**14 Mar 2016**	**27 Apr 2016**	**14 May 2016**	**12 Jun 2016**	**22 Jul 2016**	**9 Aug 2016**	**25 Sep 2016**	**16 Oct 2016**	**Total**
Circus aeruginosus (Marsh harrier)												1	1
Buteo buteo (Common buzzard)											1		1
Accipiter nisus (Sparrowhawk)										1			1
Fulica atra (Coot)										1			1
Larus ridibundus (Black-headed gull)										2			2
Larus armenicus (Armenian gull)		1			1	2	2	3	9	11	7	4	40
Columba livia (Rock döve)			1		1					1	2	1	6
Asio otus (Long-eared owl)									1				1
Caprimulgus europaeus (Nightjar)												1	1
Upupa epops (Hoopoe)										1			1
Coracias garrulus (Roller)										1			1
Galerida cristata (Crested lark)		2	2	3	1					1			9
Melanocorypha calandra (Calandra lark)		5	12	9	7	1	3						37
Motacilla alba (White wagtail)											1	1	2
Lanius minor (Lesser grey shrike)										3	2		5
Pica pica (Magpie)			1	1					1	2	3	1	9
Garrulus glandarius (Jay)									1				1
Corvus monedula (Jackdaw)	2	4	3		3	1		1	5	7	5	2	33
Corvus frugilegus (Rook)	7	5	6	9	7	1	2	5	8	11	13	6	80
Corvus cornix (Hooded crow)			1						1		1		3
Sturnus vulgaris (Starling)											21	5	26
Passer domesticus (House sparrow)	1		1		1	1		1	1	3	3	1	13
Petronia petronia (Rock sparrow)								1	1	2	2	1	7
Fringilla montifringilla (Brambling)			2	1									3
Carduelis cannabina (Linnet)			1	2	1								4
Carduelis flavirostris (Twite)			1	1	1								3
Carduelis carduelis (Goldfich)			2		2						1		5
Rhodopechys sanguineus (Crimson-winged finch)			1										1
Total	**10**	**17**	**34**	**26**	**25**	**6**	**7**	**11**	**28**	**47**	**62**	**24**	**297**

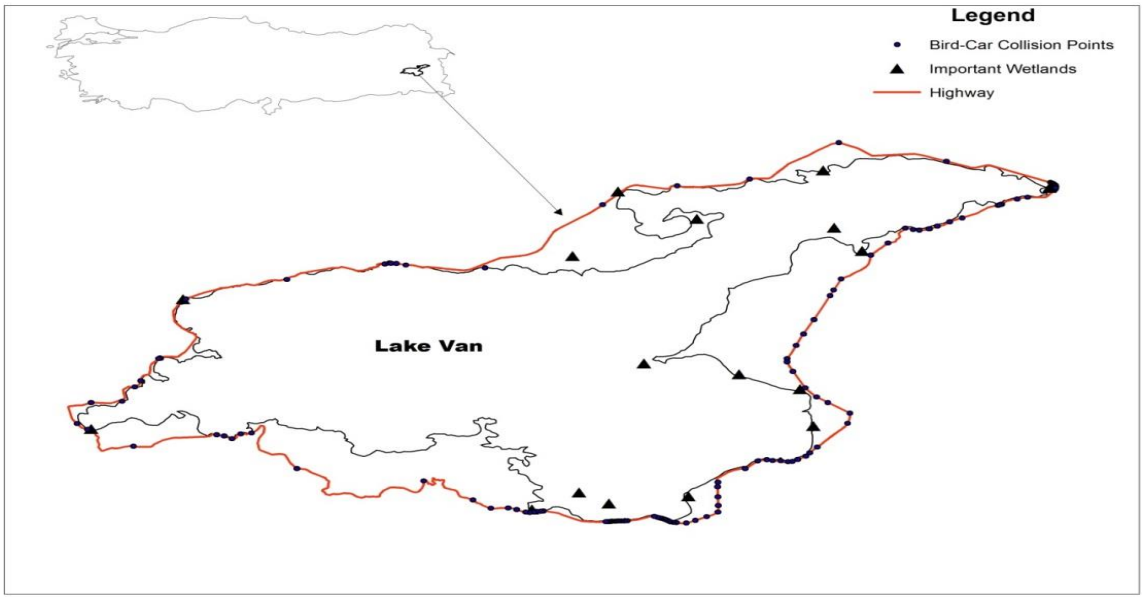

Figure 2. Map of the study area and accident locations.

As Figure 2 shows, car – bird collisions are relatively more frequent in certain areas. It was observed that accidents reached very high number around wetlands and crow reproduction colony areas. It was found that bird species in the accidents generally used wetlands as shelter in winter months, too. It was seen that the entire area was covered with snow in winter. Many songbirds that spent the night in reed fields in this period fed on the road during the day and experienced more accidents. A direct proportion was found between the closeness of wetlands to the highway and the risk of accident. The highway goes on by dividing the Ahlat Reeds and Bendimahi Reeds. More dead birds were found in these areas. The highway passes close by the living areas of birds in various other places. It was also seen that bird species in the accidents consisted mostly of ones that have a habit of feeding from the road.

Discussion and Conclusion

Kiziroğlu et al. (2013) reported bird death rates in Turkish highways a 27 birds/km/year. Ivanona et al. (2012) reported this rate as 21 in Bulgaria, while Sharma (1988) reported it as 44 for India. Rosa and Bager (2012) found this rate as 0.06 individuals/km/day in their study in Brazil. In our study, this rate was calculated as 21 birds/km/year and 0.0575 birds/km/day. The results obtain in our study mostly agree with those of other researchers. We think the small differences among these mostly came from the differences in methodology.

Kociolek et al. (2011), Coffin (2007)**,** Bosch (1989) and Johnson (1989) focused on the relationship between bird habitats around the road and bird accidents. Our study also found much higher rates of bird death in places where there were wetlands and crow colonies close to the road. We also agreed on the necessity of the science of Road Ecology in planning transportation networks.

Hansen (1982), Bashta (1999), Joselyn et al. (1969) and Wascher et al. (1988) focused on the relationship of road characteristics, vehicle speeds and bird deaths on the road. Our study also found that bird deaths were relatively less frequent in places with lower top speed limits.

Bergmann (1974), Hodson and Snow (1965), Havlin (1987), Bereszynski (1980), Wascher et al. (1988) and Erritzoe et al. (2003) reported in their studies that a consensus has not been reached yet about a standardized methodology to calculate wild animal accidents on highways. It was confirmed also in our study that different implementations lead to different results in data analysis and comparison.

Bergmann (1974) reported that fewer bird accidents happen in bad weather conditions, as drivers adjust their speeds accordingly. Our study confirmed this information. Additionally, it was seen that birds needed to land on roads in winter, since the entire region is covered in snow. This situation increases the rates of accidents in winter conditions especially for songbirds and larks.

Schoenemann (1977) and Uysal et al. (2012) focused on nocturnal species in their studies. They stated that road lighting decreased the effects of head lights. The nocturnal species found in unlighted places in our study agree with these results.

Hansen (1969), Masson, MacDonald (1995) and Göransson et al. (1978) focused on the behaviors of birds in accidents. In agreement with these studies, the species that had the highest numbers of accidents in our study was ones that had the habit to feed from the roads. It is also noteworthy that the cases found in this study were mostly of young birds that only recently started to fly.

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