

Chapter 1

HIGH MORTALITY OF AMPHIBIANS AND REPTILES ON PAZAR-HEMŞİN HIGHWAY IN BLACK SEA REGION OF TURKEY

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INTRODUCTION

The transportation related infrastructures affect the structure of ecosystems and the dynamics of ecosystem function ⁽¹⁾. The characteristics of the transportation infrastructures (e.g. road type, traffic patterns and traffic level) have some independent variables that potentially affect amphibians and reptiles, both directly and indirectly. Direct effects consist of injury or mortality, which occurring physical contact with vehicles. Although some studies propound that low traffic volumes may be sufficient to cause high levels of amphibian ^(3, 4) and reptile ⁽⁵⁻⁷⁾ mortality, generally the mortality rate increases with traffic volume. The indirect effects include habitat loss, fragmentation and alteration ⁽²⁾.

Amphibian and reptile species are endangered worldwide and they have been suffering from some important threats such as road kill, habitat modification and habitat fragmentation ⁽⁸⁻¹⁰⁾. The slow moving animals are more exposed to road kills, especially ⁽¹¹⁻¹⁵⁾. The species of amphibian and reptiles are even more susceptible to road kill because of their immobile on the road in response to an approaching vehicle ^(16, 17).

In amphibians, the distribution of essential resources (e.g. food resources) and habitats may result the migrations of them with use the roads. The amphibians that use the transportation infrastructures for migration may stay on the roads for a long time because of their move slowly and this situation increases the mortality rates ^(2, 4, 17-19).

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on Pazar-Hemşin highway. *Darevskia clarkorum* is classified in the EN (Endangered) category in the IUCN Red List. If individuals of this species are exposed to a large number of road kills, there may be a threat to the conservation of the species in near future. According to our results, another lizard species, *Darevskia rudis* was the most affected species in Pazar-Hemşin highway. The lizards may have exposed to road kill for they set out to feed.

The present study was performed from April to end of October in Pazar-Hemşin highway from Rize province. Our findings showed that some months when amphibian and reptilian species become active and begin of the reproductive behavior are critical. The species diversity on the Pazar Hemşin highway and the dead specimen frequency are matters of great significance, and may pose a serious threat to the species. The effects of roads may be minimized, at least during the critical periods of amphibians and reptiles. Thus, taking the right measures at the right points has a very important role. In long-term studies, more accurate comments can be made by increasing the number of visits to the studied area and comparing the results of the observations.

REFERENCES

1. Coffin AW. From roadkill to road ecology: A review of the ecological effects of roads. *J Transp Geogr.* 2007; 15: 396-406.
2. Jochimsen DM, Peterson CR, Andrews KM, et al. A Literature Review of the Effects of Roads on Amphibians and Reptiles and the Measures Used to Minimize Those Effects. USDA Forest Service, General Technical Report PNW. 2013; 1-78.
3. van Gelder JLL. A quantitative approach to the mortality resulting from traffic in a population of (*Bufo bufo*). *Oecologia.* 1973; 13: 93-95.
4. Lodé T. Effect of a motorway on mortality and isolation of wildlife populations. *Ambio.* 2000; 29: 163-166.
5. Fitch HS. Road counts of snakes in western Louisiana. *Herpetologica.* 1949; 5: 87-90.
6. Herrington RE, Harrelson BW. Preliminary analysis of reptiles killed on highways in southwest Georgia. *Ga J Sci.* 1990; 48: 25.
7. Enge KM, Wood KN. A pedestrian road survey of an upland snake community in Florida. *Southeast Nat.* 2002; 1: 365-380.
8. Beebee TJC. Effects of Road Mortality and Mitigation Measures on Amphibian Populations. *Conserv Biol.* 2013; 4: 657-668.
9. Rytwinski T, Fahrig L. *The impacts of roads and traffic on terrestrial animal populations, Handbook road ecology.* Wiley: 1. West Sussex.
10. Andrews KM, Langen TA, Struijk RPJH. *Reptiles: overlooked but often at risk from roads. Handbook road ecology.* Wiley: 1. West Sussex.
11. Goodman SM, Pidgeon M, O'Connor SO. Mass mortality of Madagascar radiated tortoise caused by road construction. *Oryx.* 1994; 28: 115-118.
12. Haxton T. Road mortality of snapping turtles, *Chelydra serpentina*, in central Ontario during their nesting period. *Can Field Nat.* 2000; 114: 106-110.
13. Gibbs JW, Shriver WG. Estimating the effects of road mortality on turtle populations. *Conserv Biol.* 2002; 16: 1647-1652.

14. Szerlag S, McRobert SP. Road occurrence and mortality of the northern diamond back terrapin. *Appl Herpetol.* 2006; 3: 27-37.
15. Row JR, Blouin-Demers G, Weatherhead PJ. Demographic effects of road mortality in black rat snakes (*Elaphe obsoleta*). *Biol Conserv.* 2007; 137: 117-124.
16. Bouchard J, Ford AT, Eigenbrod FE, et al. Behavioral responses of northern leopard frogs (*Rana pipiens*) to roads and traffic: implications for population persistence. *Ecol Soc.* 2009; 14: 23.
17. Mazerolle MJ, Huot M, Gravel M. Behavior of amphibians on the road in response to car traffic. *Herpetologica.* 2005; 61: 380-388.
18. McClure HE. An analysis of animal victims on Nebraska's highways. *J Wildl Manage.* 1951; 15: 410-420.
19. Fahrig L, Pedlar JH, Pope SE, et al. Effect of Road Traffic on Amphibian Density. *Biol Conserv.* 1995; 73: 177-182.
20. Rutherford PL, Gregory PT. Habitat use and movement patterns of northern alligator lizards (*Elgaria coerulea*) and western skinks (*Eumeces skiltonianus*) in southeastern British Columbia. *J Herpetol.* 2003; 37: 98-106.
21. Klauber LM. *Rattlesnakes: Their habits, life histories, and influence on mankind.* (Second edit). Berkeley: University of California Press.
22. Mendelson III JR, Jennings WB. Shifts in the relative abundance of snakes in a desert grassland. *J Herpetol.* 1992; 26: 38-45.
23. Smith L, Dodd Jr CK. Wildlife mortality on U.S. highway 441 across Paynes Prairie, Alachua County, Florida. *Fla Sci.* 2003; 66: 128-140.
24. Secco H, Ratton P, Castro E, et al. Intentional snake road-kill: a case study using fake snakes on a Brazilian road. *Trop Conserv Sci.* 2014; 7: 561-571.
25. Bernardino Jr FS, Dalrymple GH. Seasonal activity and road mortality of the snakes of the Pahay-okee wetlands of Everglades National Park, USA. *Biol Conserv.* 1992; 61: 71-75.
26. Ashley PL, Robinson JT. Road mortality of amphibians, reptiles and other wildlife on the Long Point Causeway, Lake Erie, Ontario. *Can Field Nat.* 1996; 110: 403-412.
27. Ramos E, Meza-Joya FL. Reptile road mortality in a fragmented landscape of the middle Magdalena Valley Colombia. *Herpetol Notes.* 2018; 11: 81-91.
28. Quintero-Ángel A, Osorio-Dominguez D, Vargas-Salina F, et al. Roadkill rate of snakes in a disturbed landscape of Central Andes of Colombia. *Herpetol Notes.* 2012; 5: 99-105.
29. Blaustein AR, Wake DB. Declining amphibian populations a global phenomenon. *Trends Ecol Evol.* 1990; 5: 99-105.
30. Gibbons JW, Scott DE, Ryan TJ, et al. The global decline of reptiles, déjà vu amphibians. *BioScience.* 2000; 50: 653-666.
31. Whitfield SM, Bell KE, Philippi T, et al. Amphibian and reptile declines over 35 years at La Selva, Costa Rica. *PNAS.* 2007; 104: 8352-8356.
32. KM, Langen TA, Struijk RPJH. *Reptiles: overlooked but often at risk from roads. Handbook road ecology.* Wiley: 1. West Sussex.
33. DJ, DeVault TL, DeWoody JA. Vertebrate road mortality predominantly impacts amphibians. *Herpetol Conserv Biol.* 2008; 3: 77-87.
34. M. Amphibian road kills: A global perspective. International Conference on Ecology and Transportation. ICOET: 2005.
35. L, Dodd Jr CK. Wildlife mortality on U.S. highway 441 across Paynes Prairie, Alachua County, Florida. *Fla Sci.* 2003; 66: 128-140.
36. Santos X, Llorente GA, Montori A, et al. Evaluating factors affecting amphibian mortality on roads: the case of the Common Toad *Bufo bufo*, near a breeding place. *Anim Biodiv Conserv.* 2007; 30: 97-104.

37. Matos C, Sillero N, Argaña E. Spatial analysis of amphibian road mortality levels in northern Portugal country roads. *Amphibia-Reptilia*. 2012; 33: 469-483.
38. Brzeziński M, Eliava G, Żmihorski M. Road mortality of pond-breeding amphibians during spring migrations in the Mazurian Lakeland, NE Poland. *Eur J Wildlife Res*. 2012; 58: 685-693.
39. Ashley PE, Kosloski A, Petrie SA. Incidence of intentional vehicle reptile collisions. *Hum Dimensions Wildl*. 2007; 12: 137-143.
40. Langley WM, Lippes HW, Theis JE. Responses of Kansas motorists to snake models on a rural highway. *Trans Kans Acad Sci*. 1989; 92: 43-48.
41. Beckmann C, Shine R. Do drivers intentionally target wildlife on roads? *Austral Ecol*. 2012; 37: 629-632.
42. Rosen PC, Lowe CH. Highway mortality of snakes in the Sonoran Desert of southern Arizona. *Biol Conserv*. 1994; 68: 143-148.
43. Bülbül U, Eroğlu Aİ, Kutrup B, et al. Road kills of amphibian and reptile species in Edirne and Kırklareli Provinces of Turkey. *Sinop Uni J Nat Sci*. 2019; 4: 109-121.