The Impact of Roads on Amphibians

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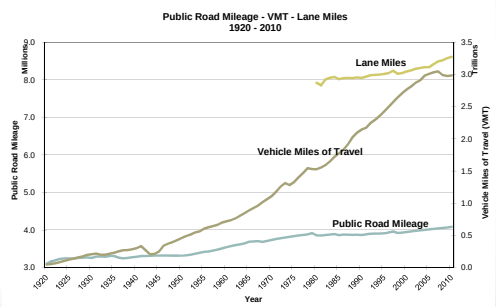
Direct Impacts

- Amphibians use roads as travel corridors, particularly after a rain, making them vulnerable to being hit
- Roads may also hinder the movement of amphibians between habitats (due to habitat fragmentation)
- Larger territory= greater impacts (Marsh et al. 2005)
- Wider road= greater impacts


Roads and Travel in U.S.



Roads in U.S.

- Total of approximately 4,083,768 miles of paved roads in the U.S., which has the longest network of roads of any country in the world (U.S. Dept. of Transportation 2010)
- Number of road miles has nearly doubled in past 90 years
- Number of cars on the road is currently estimated at over 1 billion and reach be 2.5 billion by 2050 (Organization for Economic Co-operation and Development 2011)

Other Issues

- Amphibians often use roadside ditches for breeding
- Runoff such as oil and antifreeze can kill both adult and larval amphibians
- Noise effects- Cars can drown out anuran calls
- Risk of predation increases on roads (Jochimsen et al. 2004)

Pollutants from Roads

- Heavy metals, particularly lead, can be found in high quantities, usually from gasoline additives
- Oil has been shown to have negative impacts on hatching and larval development (Mehaney 1994)
- Road salt has been found to decrease survival of spotted salamander larvae in roadside ditches
- Levels usually decline after 20m away from roads, however, larvae are often found in ditches closer to the road (Jochimsen et al. 2004)

Amphibian Deaths

- 34%-61% mortality of amphibians that enter roadways
- Up to 98% mortality of amphibians that enter motorways (heavier-traffic roads such as highways) (Hels and Buchwald 2001)
- Especially a problem for emerging immature anurans

Amphibian Deaths

- 1985 estimate in Australia- 4.45 million anurans killed on roads (Ehmann and Cogger 1985)
- Most mortality occurs during breeding season because of migration between terrestrial and aquatic habitats
- Road mortality can lead to a decrease in genetic diversity
- Roads create patches that may support higher predator density
- Road deaths in anurans have been found to account for up to 60% of annual mortality (Jochimsen et al. 2004)
- Accounts of road mortality may actually be underestimates because scavengers (vultures, raccoons, etc.) often consume dead amphibians before they can be surveyed

Solutions for Direct Mortality

- Limit road construction, particularly near wetlands
- Under-road culverts
- Trenches with culverts
- Drift fences

Solutions for Indirect Mortality

- Limiting use of gasoline additives such as lead and other heavy metals
- Riparian buffers between roads and wetlands
- Reduction in ditches which can serve as ecological traps
- Reduce chemical use on roadways, especially during the breeding season

Endangered/Threatened Amphibians

- May need special attention to help with road crossings
- Drift fences and buckets, manually transporting individuals across road
- Ex.- Western toad (*Anaxyrus boreas*) a near threatened Pacific Coastal species

Future Problems

- Roads continue to be built because populations continue to grow worldwide
- Continued fragmentation of habitat
- Logging roads in heavily forested areas of the tropics will continue to be built, creating more issues in third world countries that are not as conservation-oriented

Questions?

Beddome's Caecilian (*Ichthyophis beddomei*)

Citations

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