



Using Deer-vehicle Collisions for Deer Monitoring and Management

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Human-wildlife Conflicts in Germany

- Primarily conflicts arising from damages caused by dense populations of (attractive hunting) game
- More than 500 years of history: Mentioned in one of the 12 items (1525) where farmers requested the right to hunt on own land in order to prevent damage on crops by game
- In fact a human-human conflict (sport hunting vs. forestry and agriculture)
- Management by damage: Browsing inventories for definition of harvest numbers
- Relatively new problem: Wildlife-vehicle collisions (first scientific paper in 1959)

Deer-vehicle Collisions (DVC) in Germany

- Mostly collisions with roe deer and wild boar
- > 200k wildlife-vehicle collisions every year, still increasing
- > 3000 people injured every year
- > 50 fatalities every year
- > 500M Euro in reassurance compensations every year
- Countermeasures: Fencing (on highways), green bridges, light reflectors

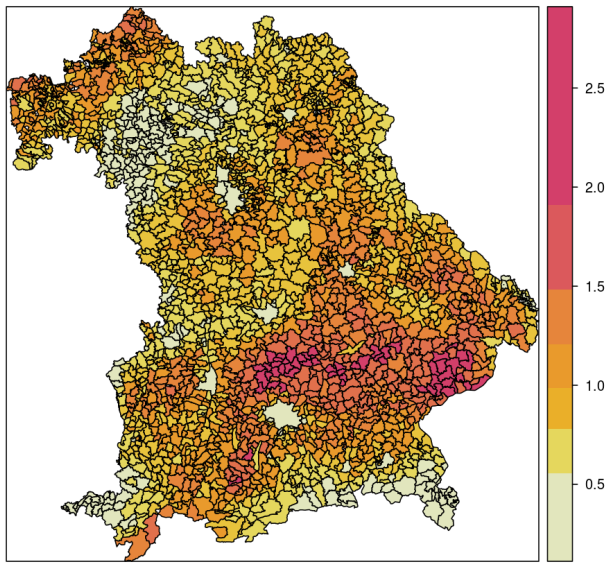
Deer-vehicle Collisions and Deer Browsing

- Two sides of the same medal
- Today: Roe deer-vehicle collisions only
- Known (?): High roe deer densities trigger browsing damage
- Hypothesis: Increasing deer densities closely linked to increasing number of deer-vehicle collisions
- Analysis: Do spatio-temporal patterns in deer-vehicle collisions reflect well-known roe deer activity patterns?
- Action: Assessment of spatio-temporal trends in deer-vehicle collisions helps to define game management plans and collision countermeasures.

Spatial Patterns

- Number of roe deer-vehicle collisions in each Bavarian municipality 2006 (> 34k) and 2009 (> 40k)
- Climate and land use data (WorldClim, Corine)
- Browsing inventories (> 3M saplings in total)
- Roe deer harvest numbers
- Model for expected number of roe deer-vehicle collisions per km (municipality risk adjusted for road lengths)

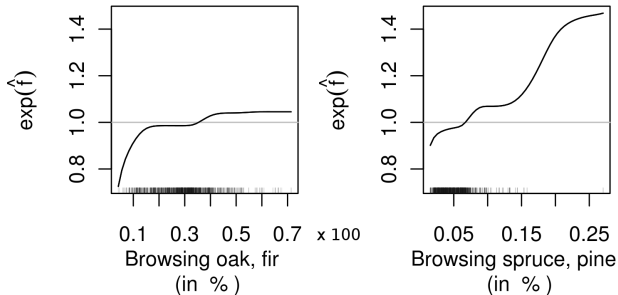
Spatial Patterns



Risk Factors

- Warmer temperatures
- Long forest edge lengths
- Median human population (low risk in very rural and very urban environments)
- Large percentage of browsed saplings

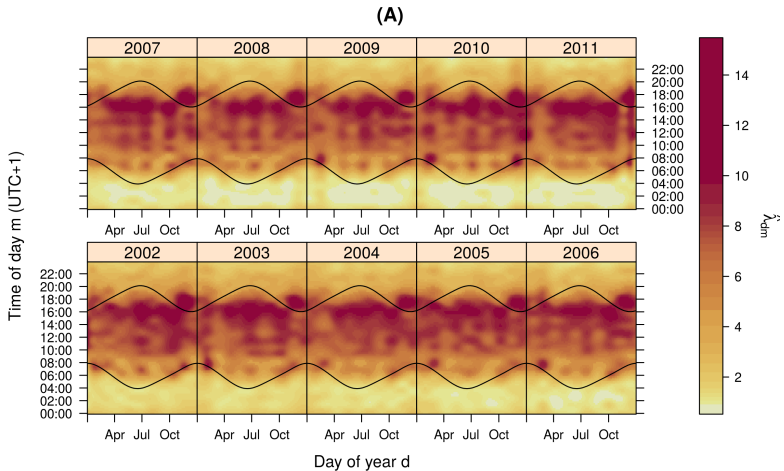
Browsing and Deer-vehicle Collision Risk



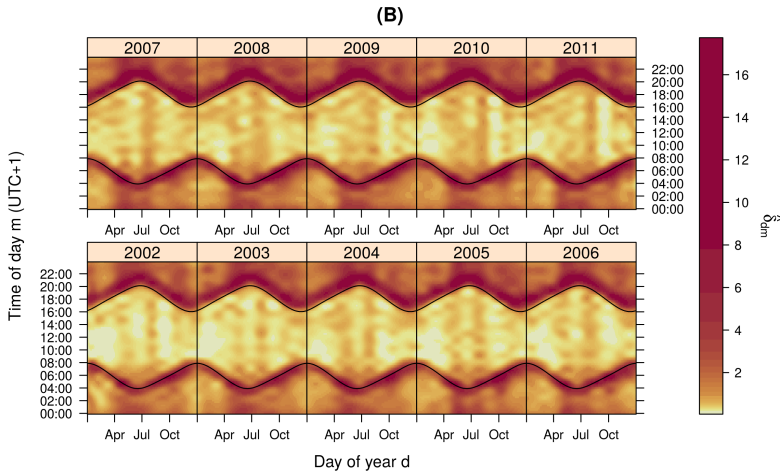
Temporal Analysis

- All accidents recorded in Bavaria between 2002 and 2011
- >340k roe deer-vehicle collisions
- >850k non-wildlife collisions
- Analysis of proportion of roe deer-vehicle collisions among all collisions

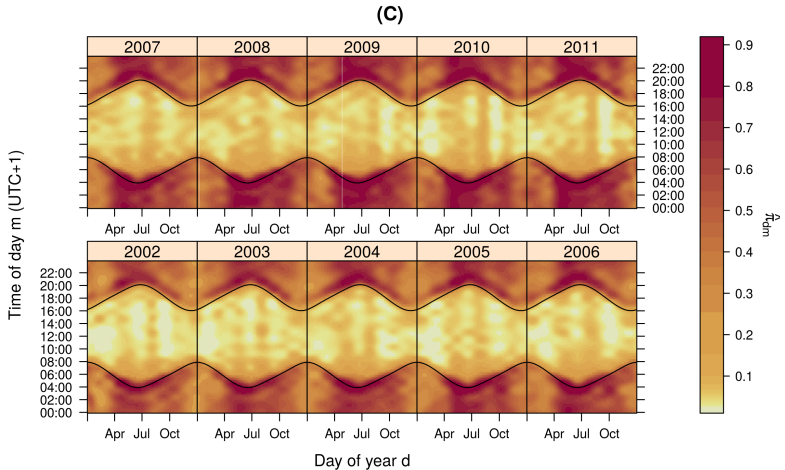
Temporal Pattern Non-wildlife Collisions



Temporal Pattern Roe deer-vehicle Collisions

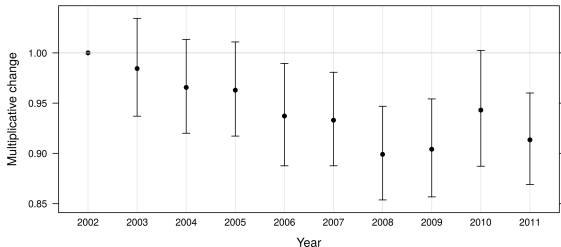


Temporal Pattern of Proportion

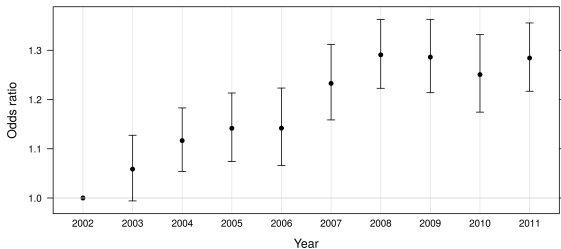


Relative Change Over Time

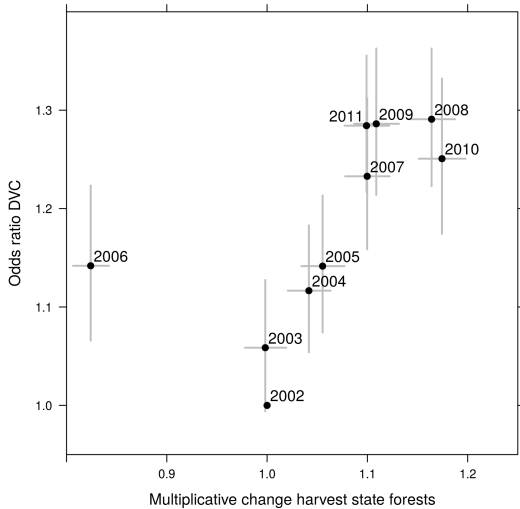
(A)



(B)



Relative Changes and Harvest Data



Summary

- Spatio-temporal distribution of roe deer-vehicle collisions in close agreement with known roe deer activity patterns
- Increasing roe deer densities are the main driver of increasing number of collisions
- Monitoring of deer-vehicle collisions in space and time helps to identify hot spots in space and time
- Deer-vehicle collisions happen everywhere, not just in forests (browsing inventories)
- Allows subsequent action: Driver warning systems, fencing, deer culling