



Quantifying the Road Effect Zone for Insectivorous bats



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Why would roads be bad for bats?



- **Habitat loss** (Bennett and Zurcher 2013; Hale et al. 2015)
- **Flight height** (Medinas et al., 2013)
- **Avoidance of noise, light and vehicle presence** (Fensome and Mathews 2016; Fure 2012; Stone et al. 2015; Threlfall et al. 2013, Zurcher et al. 2010)
- **Reduction in foraging ability** (Schaub et al. 2008; Siemers and Schaub 2011)

Road effect zone

Roadkill and barrier effects are NOT the only impacts of roads

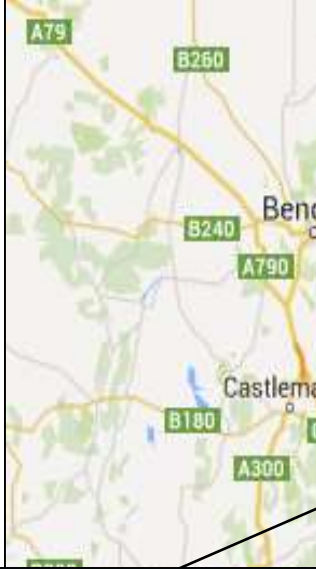
Area surrounding a road into which the ecological impacts of roads extends

- Animals will avoid this area
- Indirect loss of habitat



Road





Freeway

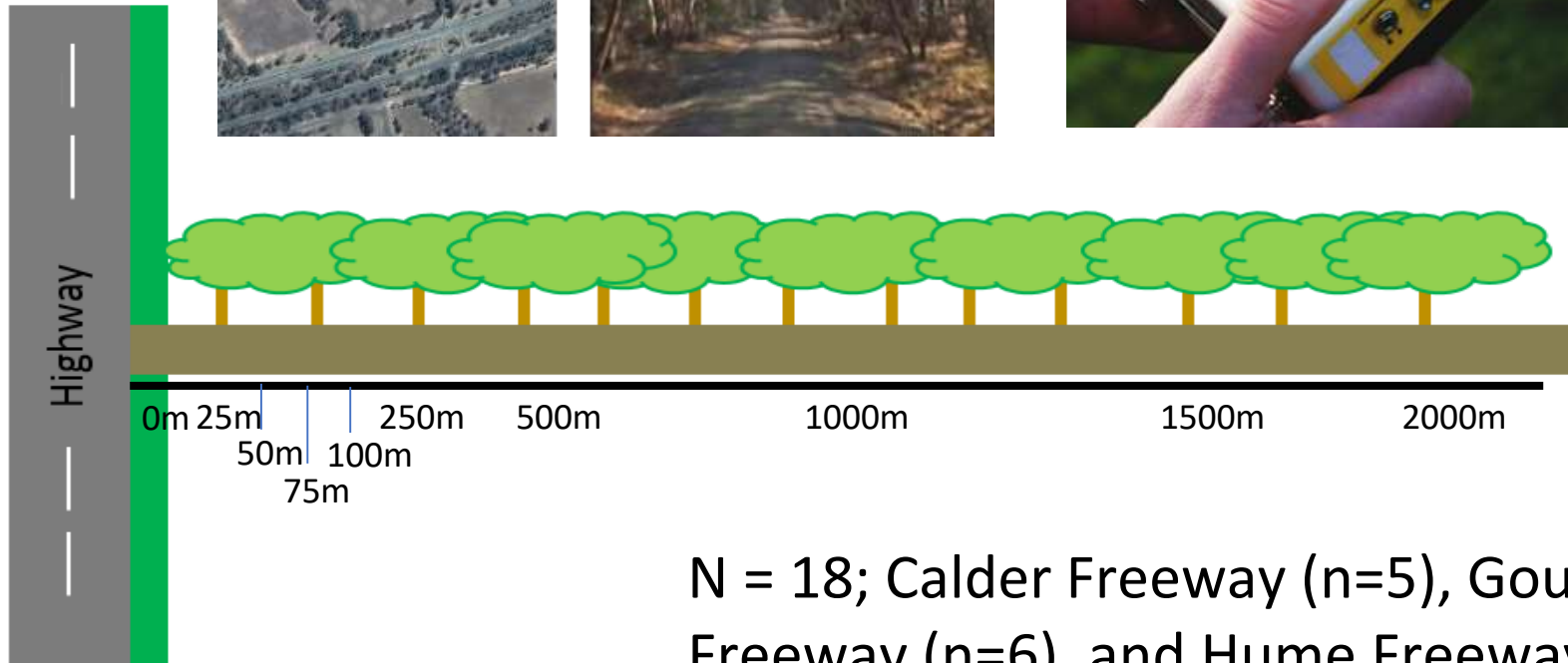




Does the activity of bats change with proximity to the highway?



Road Effect Zone for Bats - Methods



N = 18; Calder Freeway (n=5), Goulburn Valley Freeway (n=6), and Hume Freeway (n=7)

Road Effect Zone for Bats - Analysis

Total: 43, 355 calls to species

Nightly Call Activity

$$R_i \sim \text{Poisson}(\lambda_i)$$

$$\log(\lambda_i) = \beta_0 + \beta_1 D_i + \beta_2 L_i + \beta_3 C_i + \beta_4 T_i + \varepsilon_{x(i)}$$

Distance From Highway

Number of Large Trees
Canopy Cover

Temperature

Transect

Road Effect Zone for Bats - Analysis

Nightly Call Activity

$$R_i \sim \text{Poisson}(\lambda_i)$$

Temperature

$$\log(\lambda_i) = \beta_0 + \beta_1 D_i + \beta_2 L_i + \beta_3 C_i + \beta_4 T_i + \varepsilon_{x(i)}$$

Distance From Highway

Number of Large Trees
Canopy Cover

Transect

Estimated Mean Call Rate per Night

200

150

100

50

0

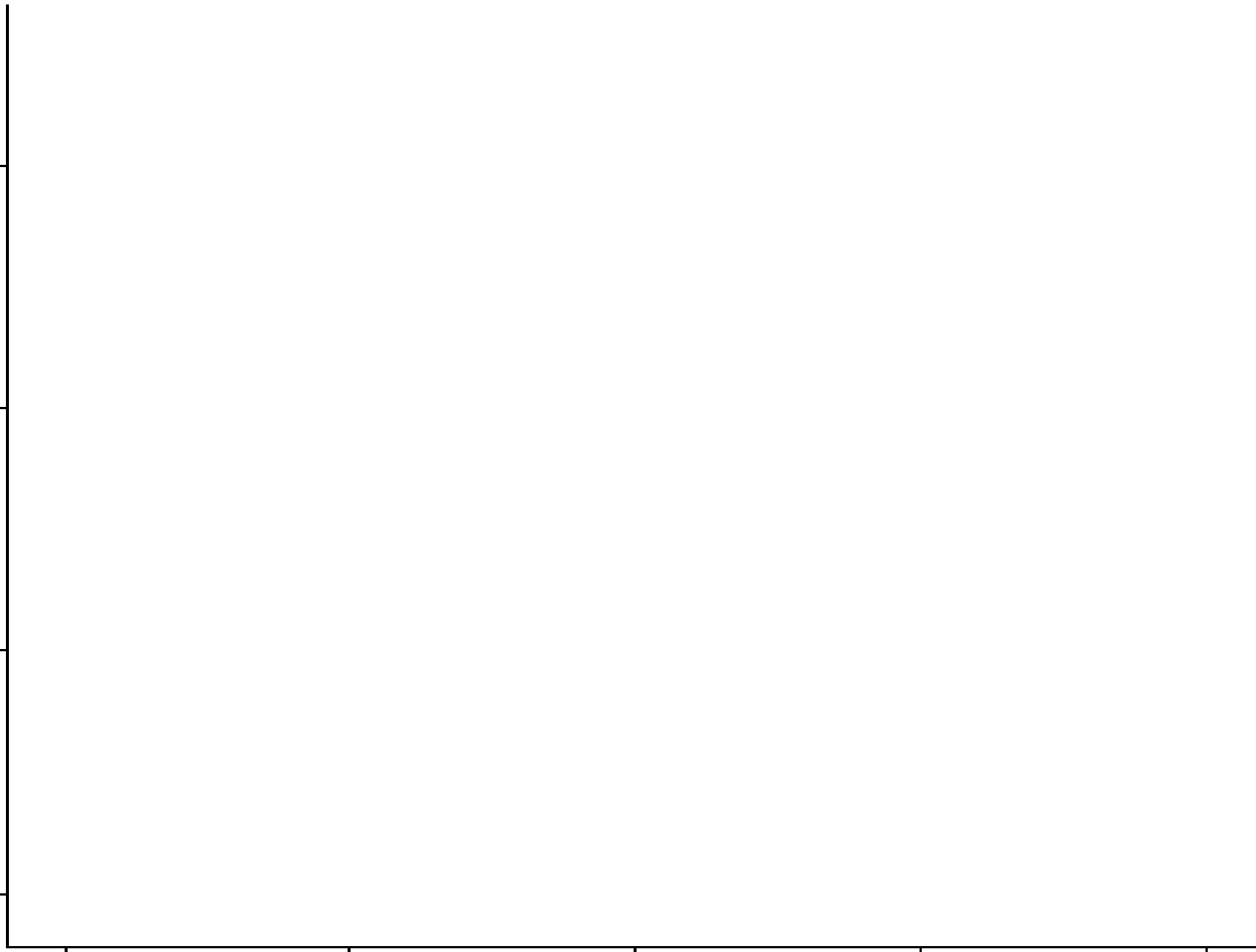
500

1000

1500

2000

Distance from the Highway (m)



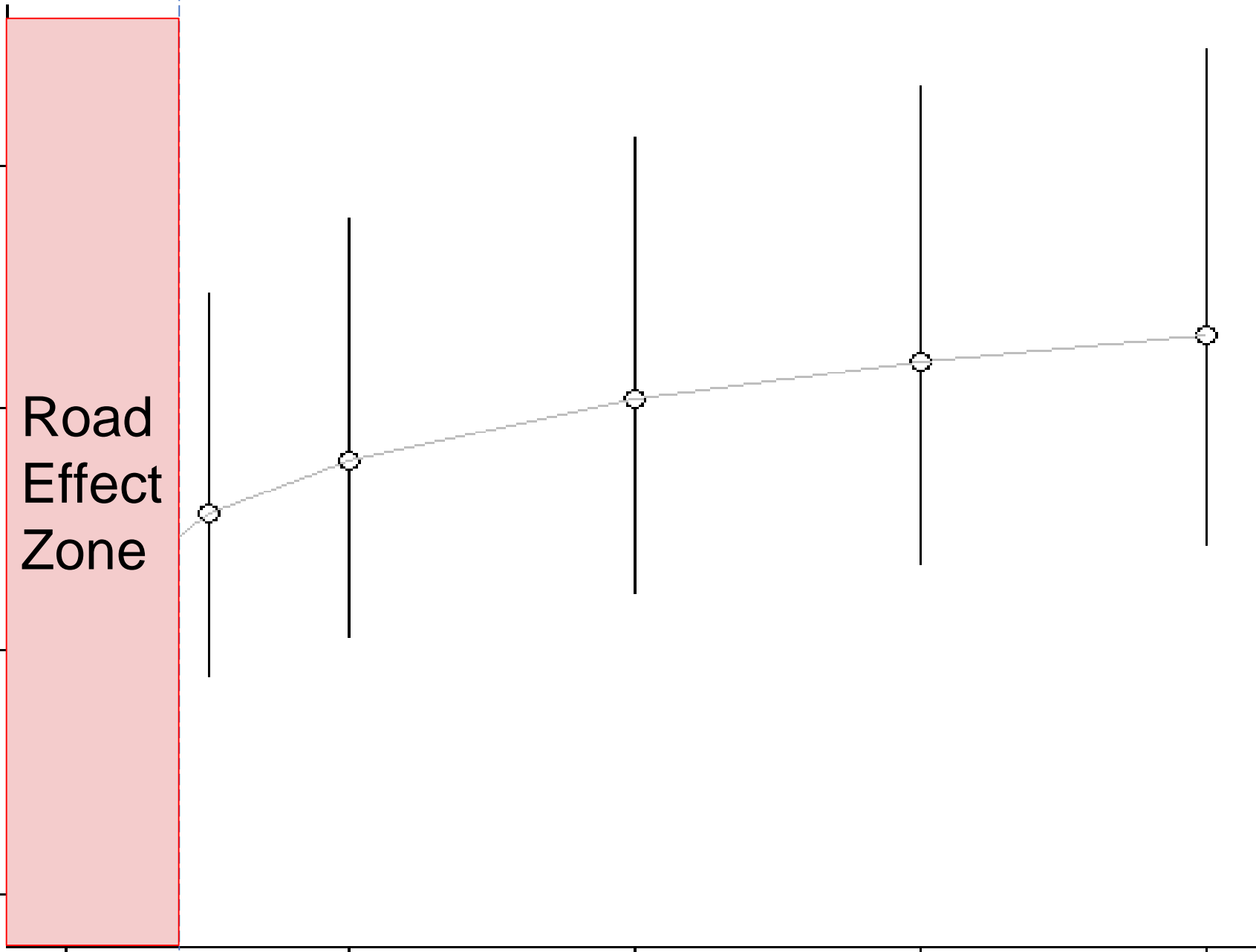
Estimated Mean Call Rate per Night

Road
Effect
Zone

200
150
100
50

0 500 1000 1500 2000

Distance from the Highway (m)



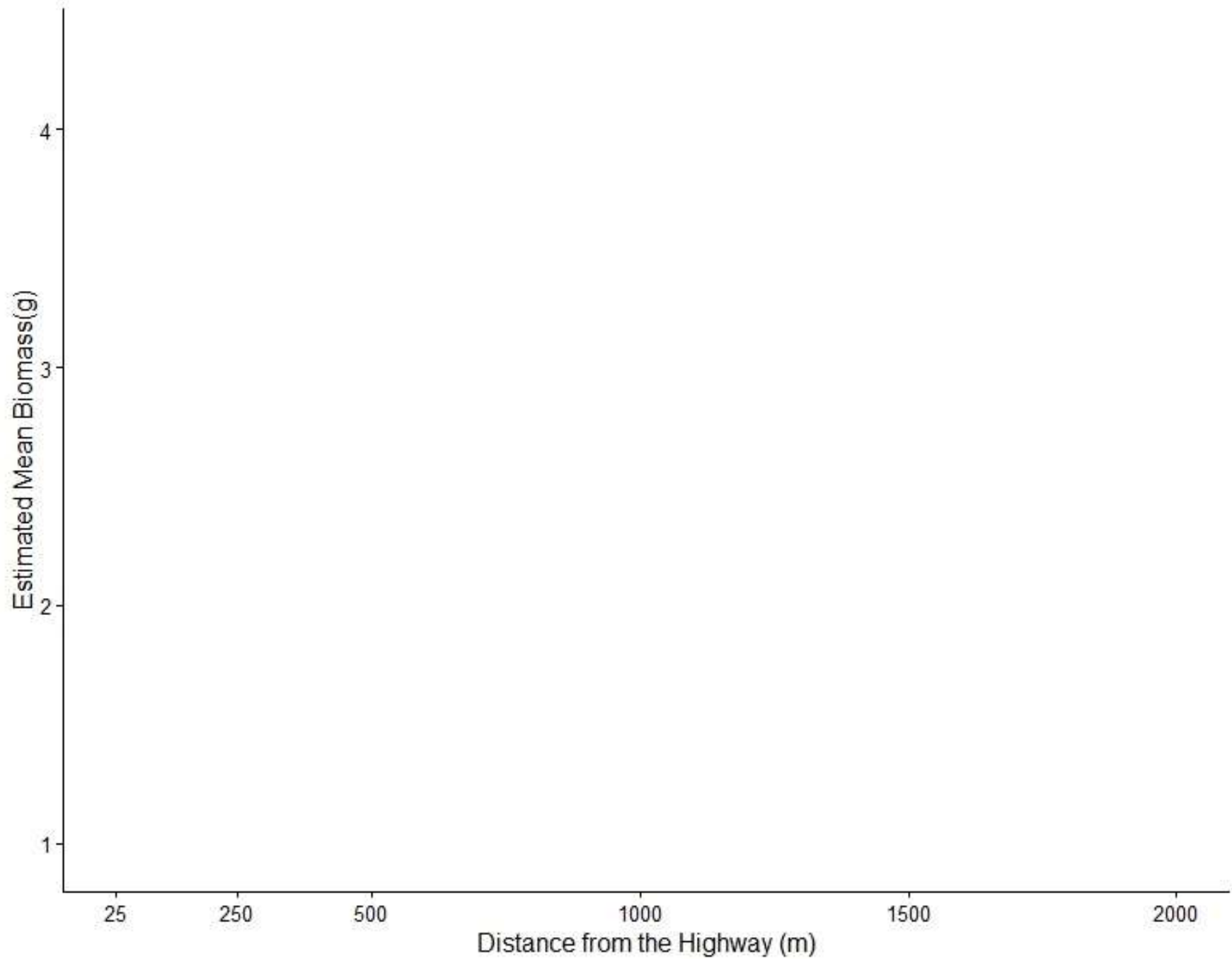
What could be causing the road effect zone?

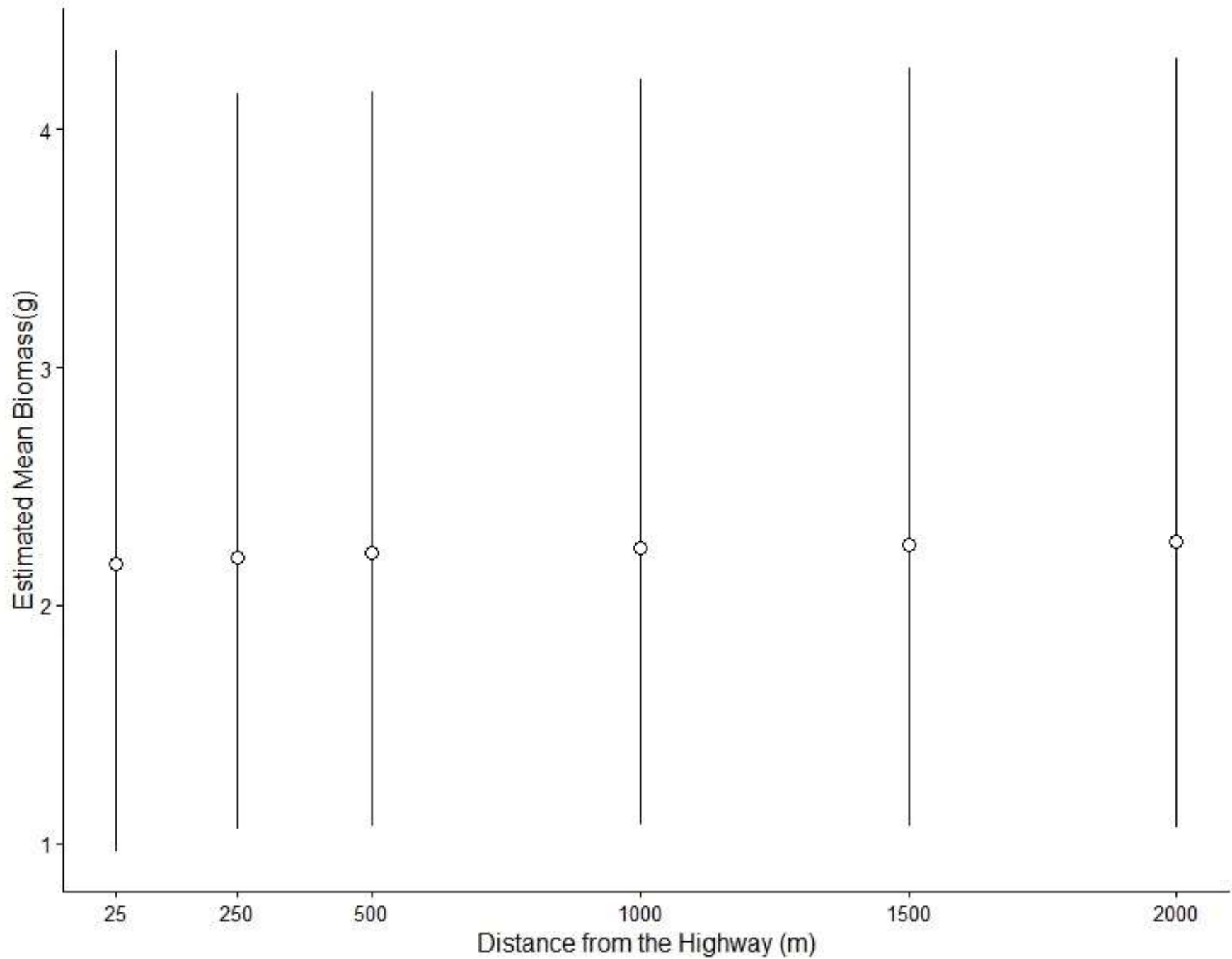
Prey Availability



Road Effect Zone for Insects - Methods

- Collected insect samples at the same transects, but on different nights
- Sorted to order, dried and weighed (Biomass)
 - 10 orders - main prey are moths, beetles, flies.





Main Conclusions

- Bats not as active in the 200 m closest to the highway
 - Should be compensated for in planning
- Road effect zone not because of lack of prey
 - Future Directions: Noise and Vehicle Presence



Thank you

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