

Red deer roaring and noise: effect of anthropogenic pressures on roaring behaviour of red deer



Daniel Ricardo*, A. Alves da Silva, F. Garcia, J. Alves

Centre for Functional Ecology (CEF), Department of Life Sciences, University of Coimbra, 3000-456 Coimbra, Portugal

*ddricardo2512@gmail.com



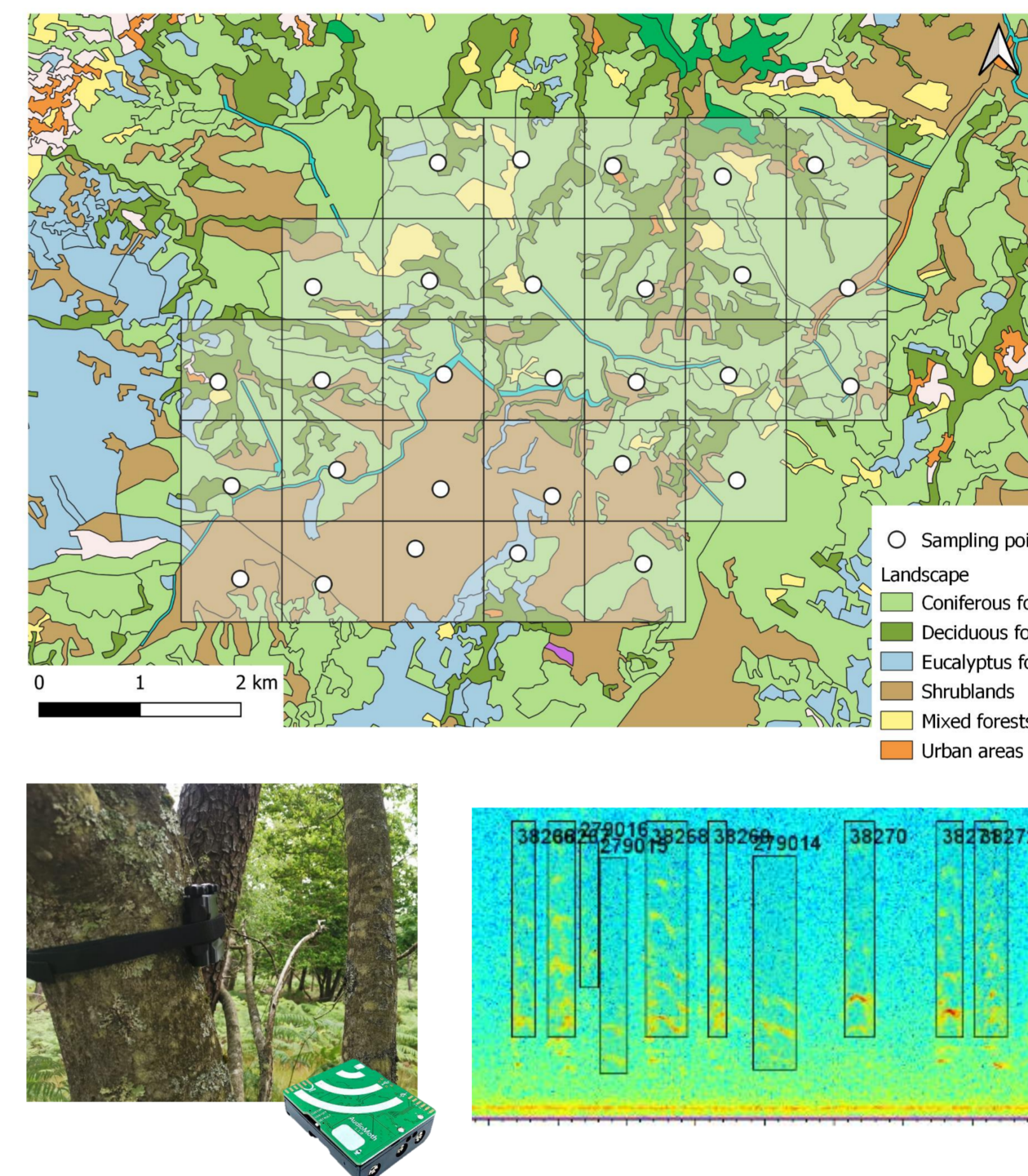
Introduction

- Red deer males have loud vocal behaviour during the rut (mating season), emitting roars, a strong component of the local soundscape¹.
- The roaring behaviour is directly related to the reproductive success of males with a role in intrasexual competition and intersexual attraction^{1,2}.
- In nature there are many anthropogenic pressures capable of affecting biodiversity such as changes in land use, overexploitation and pollution³. One form of pollution is acoustic disturbance, with noise from anthropogenic-related activities⁴.
- Changes in temporal patterns, spatial patterns, and behaviours are common impacts of noise in wildlife⁵. Communication masking is also a problem, mainly negative for species whose fitness depends on their communication, like red deer⁶.

Understand whether anthropogenic acoustic disturbance alters the roaring behaviour of red deer, both spatially and temporally



Methodology



- Lousã Mountain
- September 10th to September 23rd
- 29 sampling points
- Raven Pro Software
- NDSI – normalised difference soundscape index

Results

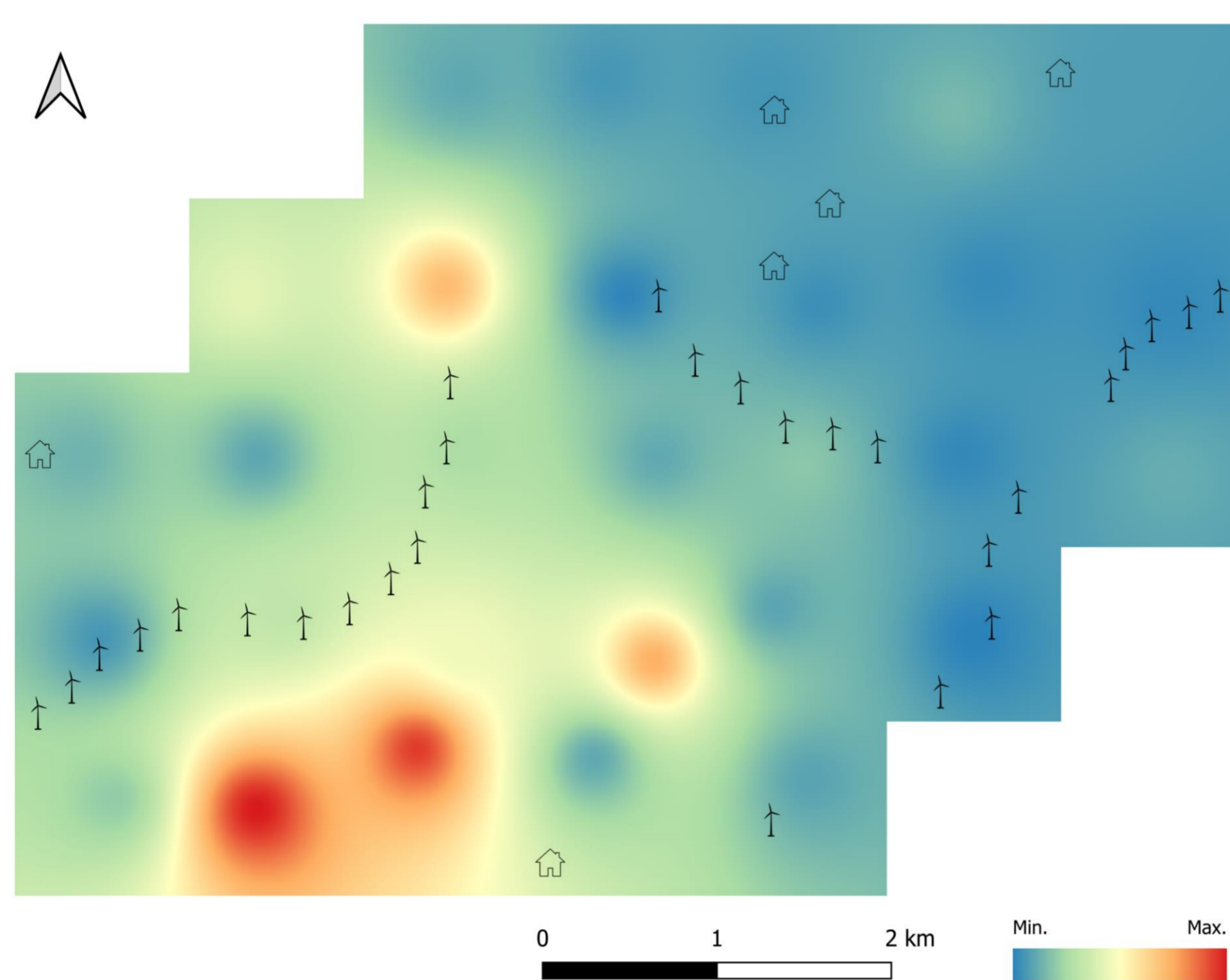


Fig.1 – Number of roars per audio file

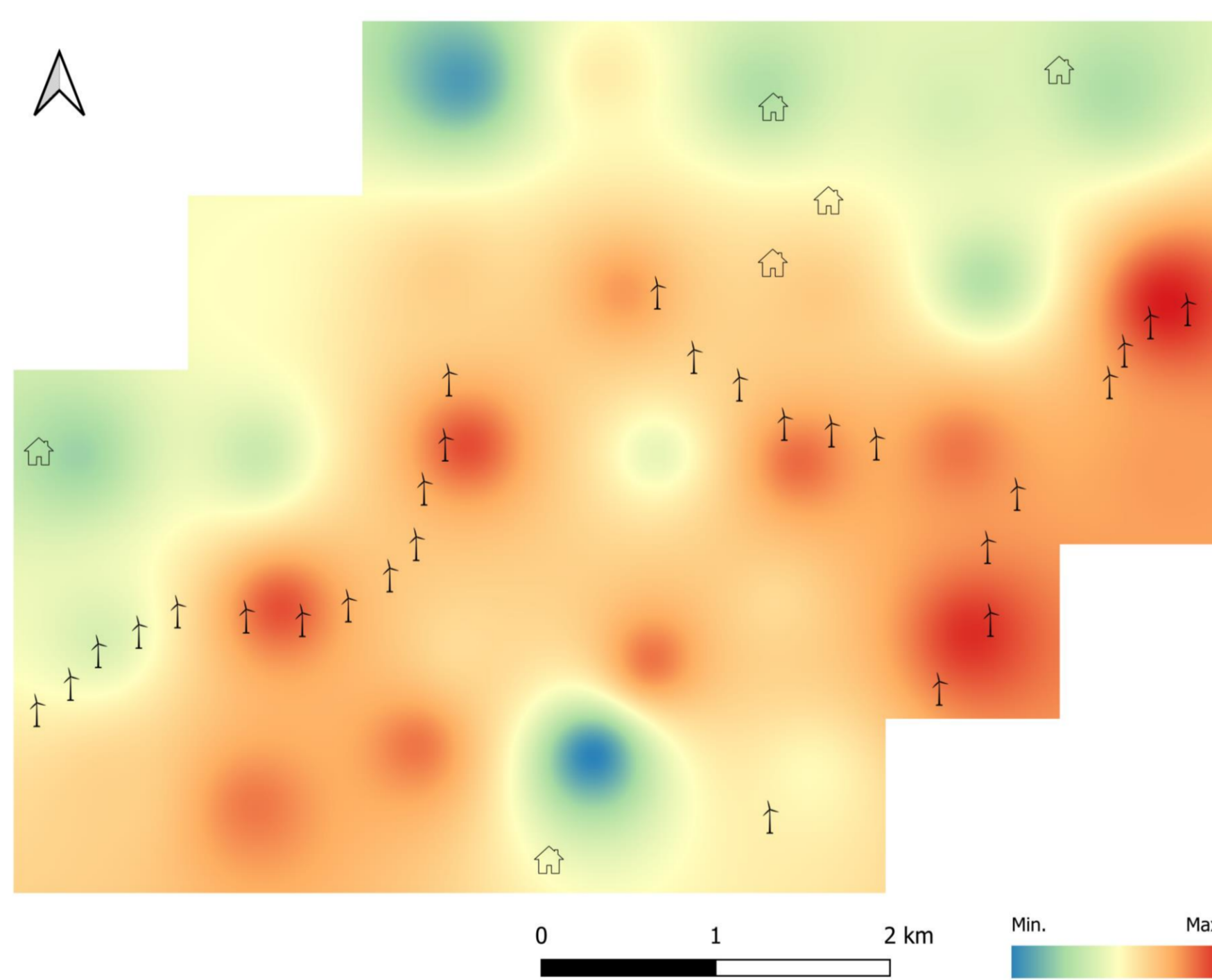


Fig.2 – Anthropophony per audio file

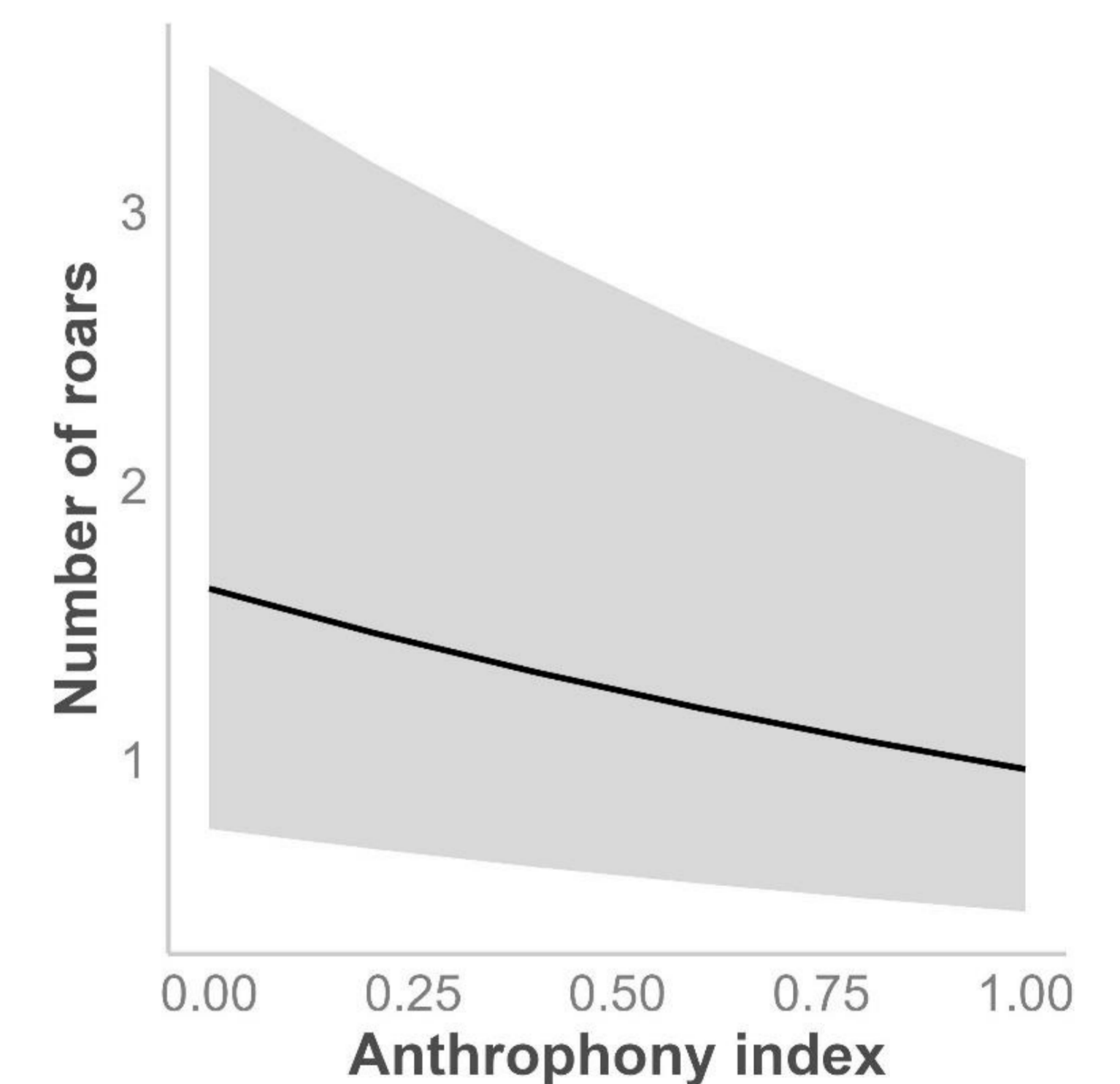


Fig.2 – Correlation between number of roars and anthropophony level

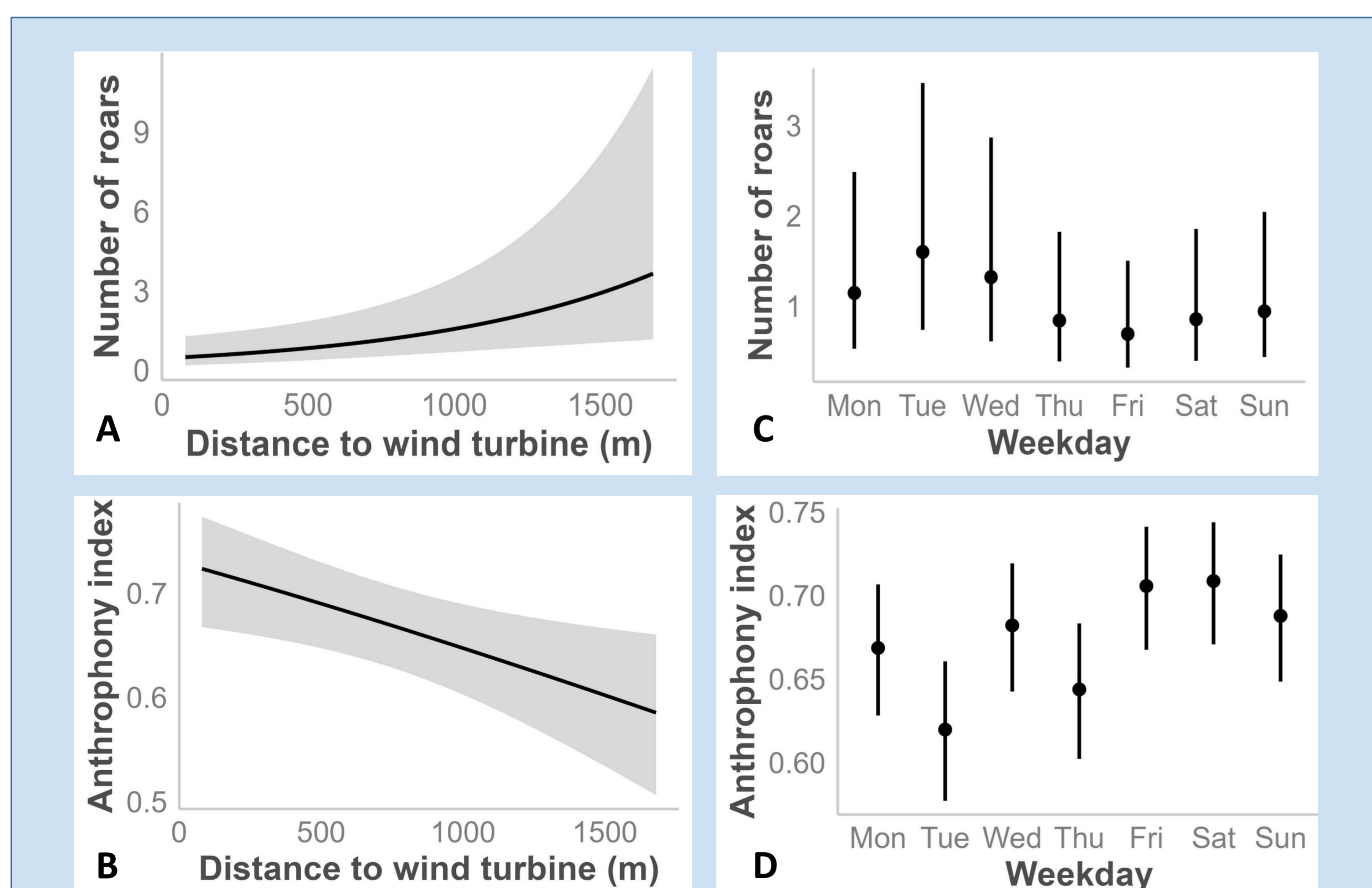


Fig.4 – Relation between the Number of roars and Anthropophony with distance to wind turbine (A and B respectively) and with Weekday (C and D respectively)

Discussion

- Roaring does not occur uniformly throughout the area. There is a **spatial avoidance of noisy areas** with anthropogenic disturbances, with males choosing to vocalise away from the main noise sources.
- The higher levels of anthropophony are registered near the **wind turbines** located in the mountain.
- Anthropogenic disturbance is higher on weekends, when ecotourism and recreational activities occur more frequently.

Conclusion

Anthropogenic acoustic pressures affect the roaring behaviour essential for the red deer mating season. So, future conservation and management strategies must include the perception of the soundscape and the preservation of wildlife acoustic behaviours.

1. Clutton-Brock, T., Guinness, F., & Albon, S. (1982). *Red deer: behavior and ecology of two sexes*. 2. Charlton, B., Reby, D., & McComb, K. (2007). Female red deer prefer the roars of larger males. *Biol Lett*, 3. 3. IPBES. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. *IPBES Secretariat: Bonn, Germany*, 22–47. 4. Miller, N. P. (2008). US National Parks and management of park soundscapes: A review. *Applied Acoustics*, 69(2), 77–92. 5. Francis, C. D., & Barber, J. R. (2013). A framework for understanding noise impacts on wildlife: an urgent conservation priority. *Frontiers in Ecology and the Environment*, 11(6), 305–313. 6. Dooling, R. J., & Leek, M. R. (2018). Communication masking by man-made noise. *Effects of Anthropogenic Noise on Animals*, 23–46.