Herbivore overabundance is not always the main driver of diet selection in red deer

I. Torres-Blas[1,*]; H. Martínez-Torres[1]; J. B. Filella[2]; R. Perea[3]; D. Gambra[3]; J. A. Calleja[4]; J. Cardells[5]; V. Lizana[5]; S. Lavín[1]; INCREMENTO consortium[+]; E. Serrano[1,*]

[1]Wildlife Ecology & Health group (WE&H) and Servei d'Ecopatologia de Fauna Salvatge (SEFaS), Departament de Medicina i Cirurgia Animals, Facultat de Veterinària, Universitat Autònoma de Barcelona (UAB), Bellaterra, Barcelona, Spain; [2]Grup de Recerca en Remugants, Departament de ciencia Animal i dels Aliments, Facultat de Veterinària, Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Spain; [3]Plant & Animal EcoLogy LAb (PAELLA). ETSI. Montes, Forestal y del Medio Natural. Universidad Politécnica de Madrid; [4]Departamento de Biología (Botánica), Centro de Investigación en Biodiversidad y Cambio Global (CIBC-UAM), Universidad Autónoma de Madrid (UAM), Madrid, Spain; [5]Servicio de Análisis, Investigación, Gestión de Animales Silvestres (SAIGAS) and Wildlife Ecology & Health group (WE&H). Facultad de Veterinaria, Universidad Cardenal Herrera-CEU, Valencia, Spain.

*Irene.Torres.Blas@uab.cat ; Emmanuel.serrano@uab.cat

Keywords: herbivore overabundance, microhistology, red deer, diet selection

Abstract: The effects of herbivore overabundance on food selection are understudied. It has been hypothesized that red deer diet selection could be driven by herbivore density and thus higher densities may lead to a more diverse diet with increased consumption of less palatable species due to reduced availability of preferred plants. To test for this hypothesis, we collected faecal samples monthly for 12 months from red deer herds in four enclosures located in Quintos de Mora (QM, Toledo, Spain) and Muela de Cortes (MC, Valencia, Spain) under two herbivore density treatments (Hyper-density: 70 deer/km^2; High-density: 35 deer/km^2). We analysed diet composition using microhistology and GAMM modelling for the proportion of the main genus and plant species consumed by red deer as response variable (mainly *Erica* spp.*, Quercus* spp.*, Quercus ilex, Rosmarinus officinalis, Thymus* spp. and herbaceous plants). Red deer diets in both areas were mainly composed of woody plants (90% of the diet in QM and 78.1% in MC). The influence of deer density on plant consumption varied among plant genus and species. For *Erica* spp. and *Thymus* spp., an interaction between sampling month and deer density explained consumption, while for *Quercus* spp. and herbaceous plants, deer density was a significant factor but not in interaction with sampling month. In contrast, deer density was not significant for *Q. ilex* and *R. officinalis* consumption. These findings highlight that the effects of deer overabundance on plant consumption in seasonal environments are highly specific to each plant genus and species, and that deer density plays a more complex role in explaining consumption of plant genus of intermediate preference to red deer, such as *Erica spp.*

[+]**The INCREMENTO CONSORTIUM** in alphabetical order

Alfonso San Miguel[1], Anna Jolles[2], Carlos Alonso[1], Carlos Fonseca[3], Carlos Hernández Castellano[1,4], David Risco[5,6], Elena Baraza[7], Esther Sebastián-González[8], Gregorio Mentaberre[9], Iolanda Filella[10], Jennifer Krumins[11], João Carvalho[3], Josep Peñuelas[10], Marcus Clauss[12], María Martínez-Jauregui[13], Marta Peláez[1], Matthew Brolly[14], Maurizio Ramanzin[15], Miguel Ibañez-Álvarez[4], Miguel Lurgi[16], Mónica G. Candela[17], Niall Burnside[14], Rafaela Cuenca[4], Rafael Villafuerte-Jordán[18], Rita Tinoco[3], Santiago Lavín[4]. Pedro Fernández-Llario[19].

1. Departamento de Sistemas y Recursos Naturales, Universidad Politécnica de Madrid, Madrid, Spain.
2. Department of Integrative Biology, Oregon State University, Corvallis, OR, USA.
3. Departamento de Biologia da Universidade de Aveiro (UA), Centro de Estudos do Ambiente e do Mar (CESAM) - UVS (Unidade de Vida Selvagem), Aveiro, Portugal.
4. Wildlife Ecology & Health group (WE&H) and Servei d'Ecopatologia de Fauna Salvatge (SEFaS), Departament de Medicina i Cirurgia Animals, Facultat de Veterinària, Universitat Autònoma de Barcelona (UAB), Bellaterra, Barcelona, Spain.
5. Departamento de Medicina Animal, Facultad de Veterinaria, Universidad de Extremadura, Spain.
6. Neobéitar S.L., Cáceres, Spain.
7. Departament de Biologia, Universitat de les Illes Balears, Palma de Majorca, Spain.
8. Departamento de Ecología, Universidad de Alicante, Alicante, Spain.
9. Wildlife Ecology & Health group (WE&H), Departament de Ciència Animal, Escola Tècnica Superior d'Enginyeria Agrària (ETSA), Lleida, Spain.
10. Center for Ecological Research and Forestry Applications (CREAF) - National Research Council (CSIC), Universitat Autonoma de Barcelona, Bellaterra, Spain.
11. Department of Biology and Molecular Biology, Montclair State University, New Jersey, USA.
12. Clinic for Zoo Animals, Exotic Pets and Wildlife, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland.
13. National Institute for Agriculture and Food Research and Technology (INIA), Forest Research Centre (CIFOR), Madrid, Spain.
14. School of Environment & Technology, University of Brighton, Lewes Road, Brighton, UK
15. Department of Agronomy Food Natural Resources Animals and Environment DAFNAE, University of Padova, Legnaro, Italy.
16. Department of Biosciences, Swansea University Medical School, Swansea University, Swansea, UK.
17. Departamento de Sanidad Animal, Facultad de Veterinaria, Universidad de Murcia, Campus Mare Nostrum. Murcia, Spain.
18. Instituto de Estudios Sociales Avanzados (IESA-CSIC), Córdoba, Spain.
19. Innovación en gestión y conservación de Ingulados S.L., Cáceres, Spain