

# Coexistence of medium-sized carnivores in managed landscapes

José Gonçalo Curveira Santos

In order to define appropriate management decisions, it is crucial that we understand mechanisms governing patterns of species coexistence and natural communities' organization. Even though carnivores play a key role in ecosystem functioning, due to their elusive behaviour, study of these species is a very challenging task and much is yet to be known regarding carnivore assemblages.

According to theory, co-occurring ecologically similar species tend to differentiate their use of resources in order to avoid competition. Hence, competing species are expected to adapt the “which, where and when” patterns of resource use, i.e. their ecological niche, so as to promote co-existence. This process is often referred to as niche partitioning.

In intensively managed landscapes of Southern Iberia, management actions related to intensive agriculture and forestry practices have increased the complexity of the landscape and altered the availability of resources. Thus, this type of landscape is expected to offer new possibilities for local carnivores that can promote coexistence if distinct species exploit the additional resources differently. In this project we focused on a community of medium sized carnivores inhabiting a heavily managed savannah-type cork oak (Montado) landscape in central Portugal. Our goal was to understand the organization and structure of this community and how it is shaped by human derived disturbances.

By means of a camera trapping approach we explored patterns of differentiation in the time and space niche dimension between five medium sized carnivore species: red fox (*Vulpes vulpes*); Eurasian badger (*Meles meles*); common genet (*Genetta genetta*); Egyptian mongoose (*Herpestes ichneumon*) and feral cat (*Felis sp.*). Using special cameras that are automatically triggered every time an animal crosses the sensor of the device, we registered the exact time and place of every animal photographed. Based on such information we evaluated the times of the day in which each species was most active as well as their habitat selective preferences. Together, these insights allowed us to understand how the community is organized, by comparing species patterns of activity during a day cycle and identifying differences in patterns of habitat use.

Results suggest that behavioural adjustments, manifested by patterns of segregation in both time and space, promote coexistence among local carnivore species. The diurnal character of mongooses' activity contrasted with the predominantly nocturnal habits of remaining species. Moderate temporal segregation was found between the strictly nocturnal badger, and the two facultative nocturnal species, the fox and feral cat. Interestingly, differences in shrub cover between Montado patches were the main source of spatial segregation between the three most abundant species. While foxes preferred dense understories the badger and mongoose favoured mosaics of sparse shrubs. Since these distinct habitat types result from different levels of human disturbance, we may argue that human-induced landscape heterogeneity stimulates differential habitat preferences, thus promoting coexistence.

By understanding how human actions influence natural communities we can adopt management decisions that reconcile exploitation of natural resources with conservation principles, ultimately preserving biodiversity in humanized landscapes.

Degree project in Biology, Master of Science (2 years), 2014

Examensarbete i biologi 30 hp till magisterexamen, Uppsala universitet, 2014

Biology Education Center and Centre of Environmental Biology, Faculty of Sciences, Lisbon University

Supervisors: Dr Margarida Santos-Reis and Dr Mats Björklund