Ecology, physiology and behaviour

A comparative analysis of activity patterns and temporal niche overlap between golden jackal (*Canis aureus*) and red fox (*Vulpes vulpes*): south Slovakia vs. northeast Italy

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Coexisting species often adopt strategies to minimize competition for shared resources. While various mechanisms can facilitate coexistence, usually subordinate species adjust their ecological niche to avoid direct encounters with dominant competitors. This study examined temporal niche partitioning between two mesocarnivores: golden jackal (*Canis aureus*) and red fox (*Vulpes vulpes*), two sympatric canids with a high potential competition due to their similar ecological requirements. To gain a significant understanding of the coexistence mechanisms between the target species we used data from two different camera-trap surveys conducted in October and November 2023 in two distinct areas: Friuli Venezia Giulia region (north-east Italy) (hereafter, FVG) and the protected landscape area of Cerová Vrchovina (hereafter, CV PLA) in Slovakia. We hypothesize that both mesocarnivores would exhibit a similar temporal use of habitat in CV PLA, while in FVG, there would be a greater degree of temporal niche separation. The study areas were divided into equal sampling units (SAs) using a 3.3 x 3.3 km grid with a total of 23 squares: 15 in CV PLA and 8 in FVG, within which there were 35 camera-trap stations: 19 in CV PLA and 16 in FVG. There were in total 869 trapping days in CV PLA (on average 46 days per SA) and 572 trapping days in FVG (on average 36 days per SA).

Results showed a higher RAI (relative abundance index) for red fox in CV PLA (33.13) compared to FVG (5.42), and conversely a higher RAI for golden jackal in FVG (6.12) compared to CV PLA (2.65). The naïve occupancy for red fox was 1.00 in CV PLA and 0.44 in FVG, while the one of golden jackal was 0.11 in CV PLA and 0.31 in FVG. Results also revealed a higher temporal overlap between the target species in CV PLA compared to FVG, suggesting greater avoidance of foxes towards jackals in the latter region. Several factors could explain these results: the higher detections of jackals in FVG compared to foxes, and the opposite pattern in CV PLA; the uniform distribution of the fox in all camera-trap locations in CV PLA; the lower naïve occupancy of golden jackal in CV PLA compared to FVG. Potentially other factors could be the higher human disturbance and agricultural activity in FVG versus more extensive forest cover in CV PLA, and the higher detections of potential prey for both species in CV PLA compared to FVG. The results of this study partially validated our predictions, indicating that the target species adopted distinct temporal patterns to coexist, likely due to ecological dissimilarities between the study sites.