Consumption by scavenging species of fallow deer (Dama dama) killed but not consumed by the wolf (Canis lupus) in a protected area

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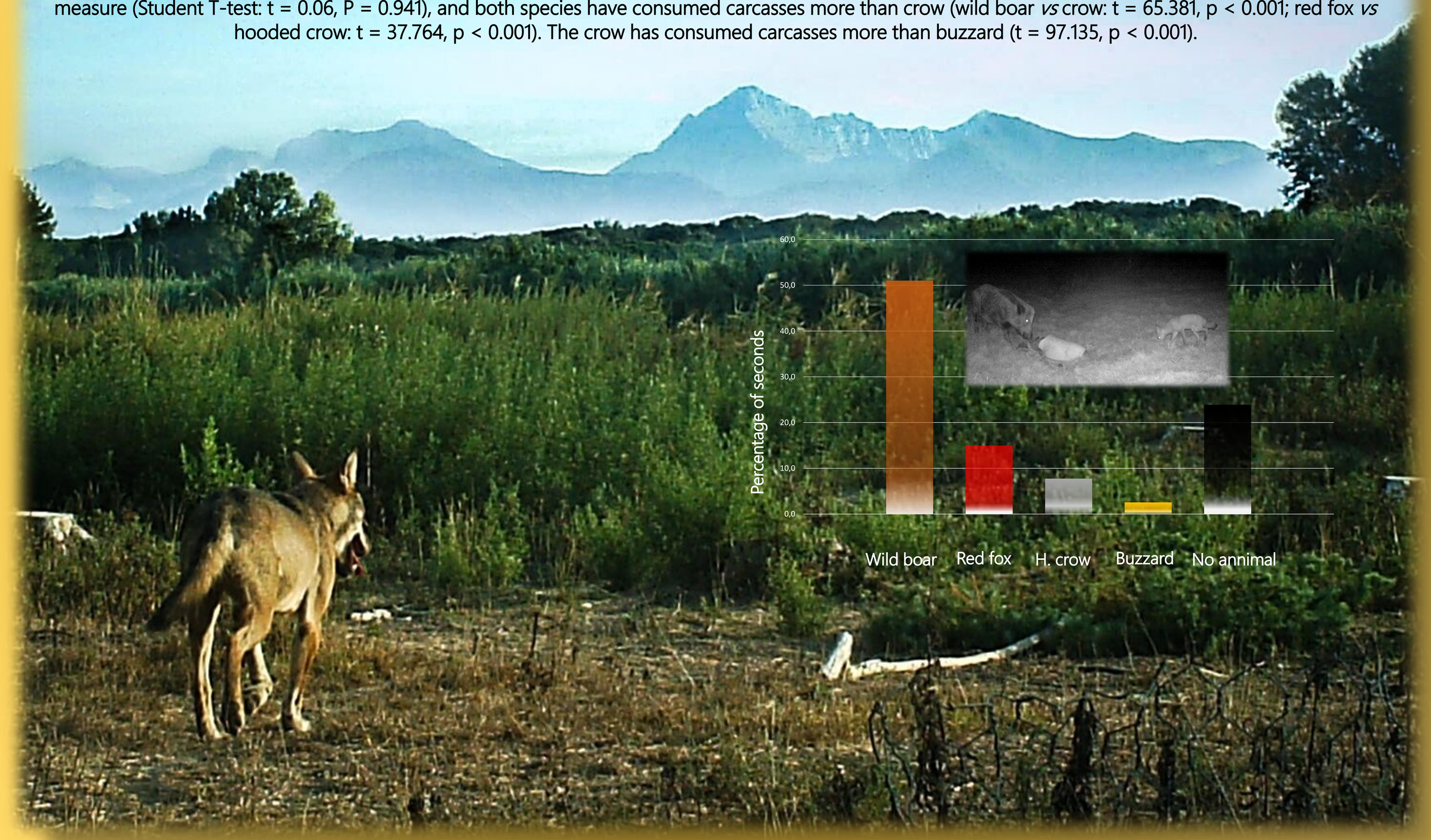
Introduction: In many part of Europe wild ungulates are the main prey in wolf's diet (Okarma 1995; Gazzola et al. 2005). As a consequence of the wolf's predations, phenomena of kleptoparasitism may occur by scavenger species, also belonging to the omnivorous species as in the case of the wild boar, *Sus scrofa* (Ballari and Barrios-Garcia 2004; Focardi et al. 2017). Our goal is to investigate the wolf predatory behavior on fallow deer (*Dama dama*) and the appearance of scavengers species in the presence of carcasses derived from predations.

Methods: Prey consumption is evaluated by camera trapping survey in San Rossore Estate, Tuscany Region (43°43'20" N; 10°18'47"E) where a wolf male presence is documented since autumn 2016. Its main prey here is fallow deer, whose local density is about 46 individuals/100 ha. The only other wild ungulate is wild boar with a density of 7.3 individuals/100 ha. Domestic ungulates are represented by cattle and horses, ranging from 30 to 50 individuals each.

Results: We monitored 7 carcasses of fallow deer killed by wolf with movement-triggered cameras, filming the activity of wolf and others species which act as scavenger. In any of the 7 cases, a second visit of the wolf to carcass of the deer he killed was ever recorded. The consumption of deer carcasses was done by opportunistic species, in particular wild boar, fox (*Vulpes vulpes*), hooded crow (*Corvus cornix*) and buzzard (*Buteo buteo*). The different species showed a different time of permanence on the carcasses (ANOVA: df = 3, F = 7.944, p < 0.001). Moreover, wild boar and red fox have consumed the carcasses in equal measure (Student T-test: t = 0.06, P = 0.941), and both species have consumed carcasses more than crow (wild boar *vs* crow: t = 65.381, p < 0.001; red fox *vs* hooded crow: t = 37.764, p < 0.001). The crow has consumed carcasses more than buzzard (t = 97.135, p < 0.001).



Conclusion: These preliminary results, showed as in San Rossore Estate the wolf did not consume the entire carcass of the fallow deer, but concentrated mainly on the most energetic parts such as the heart, lungs and kidneys. Probably this particularity can be linked to the high density of the deer recorded in the estate, and it is possible to connect this aspect to a killing surplus behavior. It was also interesting to note that the predation sites were close to the fences: this led to the hypothesis that they could compensate for the lack of a real "herd", as they were, in all probability, used by the single wolf to trap the prey, in order to complete the predatory act more easily.

The wolf's limited consumption pattern of the carcasses made available a consistent resource for scavengers. This was particularly evident for wild boar, which was always the first species to appear on fallow deer carcass killed by the wolf. In our context, the wild boar did not even have to compete with the apex predator to access the carcass, as happened in other ecosystems (Focardi et al. 2017). As matter of fact no one time the wolf returned to prey after the predatory event. Moreover, the use of carcasses could have expanded the animal share of boar's diet.

These scenarios open up new research themes that will be explored in an immediate future.

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