Analysis of land utilisation by red deer in the Apennine Mountains

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INTRODUCTION

One of the territories most frequented by the red deer (Cervus elaphus) population of the Tosco-Emiliano Apennine Mountains is the Acquerino-Cantagallo Nature Reserve and adjacent areas. These are characterized by forests interrupted by a few clearings for grazing, often encroached by shrubs and invasive species. The red deer are characteristic of the woodland core, where they prefer dense woodland or thicket for cover, resting up in dense cover, moving out to feed in slightly more open habitat, and feeding on patures.

THE AIM

The research was conducted to assess the methods for mitigation of damage to agricultural crops through the investigation of the use of trophic resources by red deer.

MATERIAL AND METHODS

The research was conducted from November 2008 to March 2009 on 12 red deer captured. The type of GPS collars used were Vectronic Aerospace ® with GPS, VHF transmitter, sensors for activity, environmental temperature and mortality measures.

The collars were programmed to record positions every hour for 24 hours a day, and to transmit data from the GSM system every 7 fixes. As proposed by Johnson (1980), resource selection was investigated by comparing the composition of habitat types present in the animals' home ranges with the available composition in the study area (second-order selection), as well as in terms of selection of particular land use categories within the animal's home range (third-order selection). Overall habitat selection patterns were analysed by compositional analysis where as use and availability of meadows and pastures were compared by the Wilcoxon's matched pairs test

RESULTS AND DISCUSSION

Home range sizes in ha			
Animal	**Spring**	**Summer**	**Autumn**
F8	152	120	118
F12	43	102	135
F10	86	42	154
F4	79	55	141
F6	136	75	368
F11	124	39	735
F2	70	79	259
F5	87	53	207
F3	83	302	.
F7	171	225	279
F1	664	504	1343
F9	2809	242	2358

Table 1. Home range sizes (95% Kernel) of the 12 hinds (F3 deceased in autumn) in spring (21st March – 20th June), summer (21st June – 22nd September) and autumn (23rd September – 20th December).

The seasonal home range sizes of the 12 hinds were highly variable between individuals ranging from 39 ha to 2809 ha with a median size of 136 ha (Tab. 1).
We should note that the precise habitat occupied may of course vary from place to place as climatic conditions change, or as the community itself varies and any one species finds itself living in association with different combinations of other deer. Land use in terms of habitat composition within spring and summer home ranges differed significantly from habitat availability in the study area (compositional analysis, Tab. 2).
spring: n = 12, Λ = 0.3, χ2=14.2,
P < 0.05;
summer: n = 12, Λ = 0.3, χ2=15.2,
P < 0.05;

This result suggests that the hinds did not establish their home ranges at random in these periods of the year. In particular, in spring and in summer, hinds included a higher proportion of pastures and meadows in their home ranges than expected by their availability in the study area (Fig. 1). The use of different habitat types in terms of number of GPS locations in each type differed significantly from the habitat distribution within the seasonal home ranges for all seasons In spring, with the beginning of the growing cycle, and in autumn, with the vegetative re-growth, hinds spent more time in pastures and meadows than expected by their availability (Fig. 1).

Land use	Study area	Spring	Summer	Autumn
Coniferous woodland (%)	6.7	5.3	6.1	5.3
Broadleaves woodland	77.1	71.4	70.6	74.3
Chestnut woodland and orchards (%)	7.5	6.6	8.8	8.6
Pastures and meadows (%)	3.4	9.9	7.3	5.5
Road verges (%)	2.5	3.1	3.1	2.4
Arable land (%)	1.0	1.5	2.3	1.8
Urban areas (%)	1.8	2.2	1.8	2.1

Table 2. Percentage habitat composition in the study area and average habitat composition within seasonal home ranges.

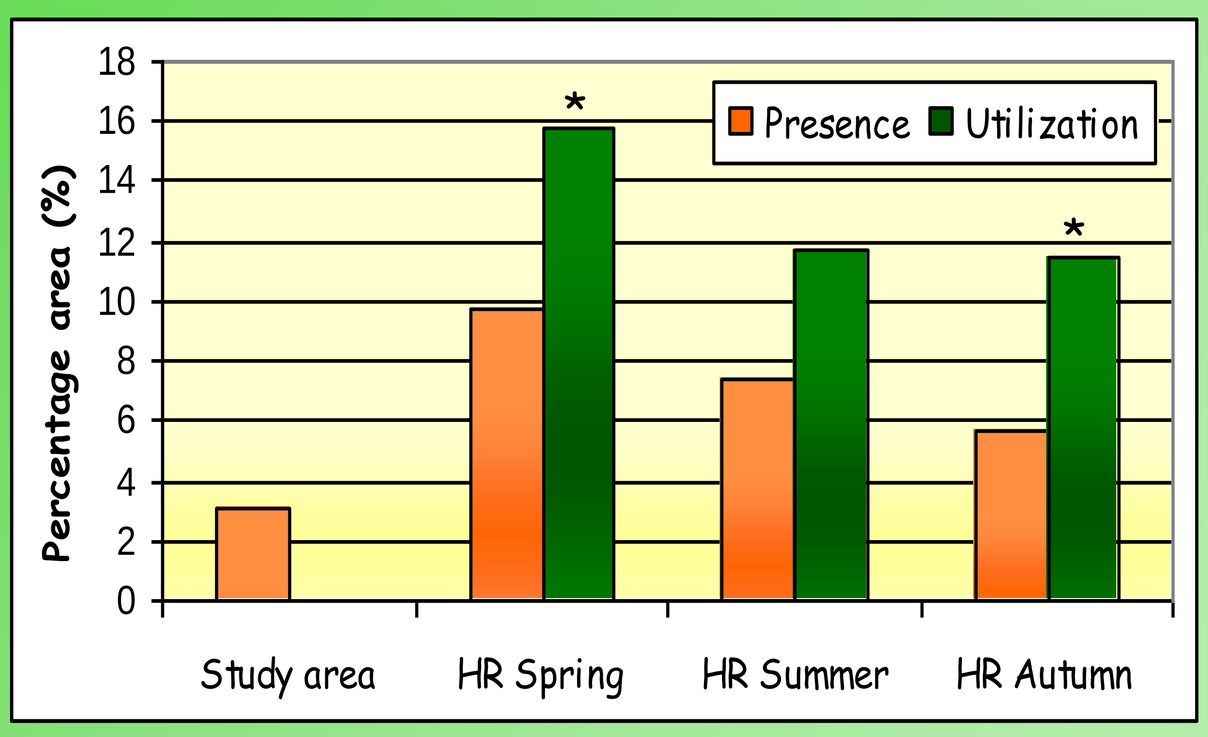

Figure 1. Percentage area of pastures and meadows (PM) in the study area and within home ranges (HR) and its utilization (% locations) in consecutive seasons.
Different letters (A, B) indicate significant differences (P < 0.05) between % presence of PM in the study area and in the seasonal home ranges; * indicates significant difference (P < 0.05) between % presence of PM and its use in seasonal home ranges.

Conclusions

Our results confirm the great value of grasslands resources for red deer and give emphasis to the recovery of abandoned open areas for management purposes, as pastures and meadows are of particular importance in spring when hinds have high energetic demands. Thus, the recovery of abandoned open areas and the opening of new small areas not only meet the forage demands but may reduce damage to agricultural areas and forest regeneration stands.