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# Feeding evaluation of spontaneous species used by wild ungulates

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**ABSTRACT** - Abandonment of traditional agricultural practices can produce remarkable effects on land use and on the vegetal composition of marginal areas. This is particularly true in the once grazed zones in the mountain environments, that are now affected by encroachment of shrubby vegetation. The conservation of these open areas and the preservation of a correct ratio pasture/wood are of extremely importance for wild animals. In this note we describe the effectiveness of agronomical intervention carried out to enhance pasture quality in a protected area of central Italy. Data collection concerned botanical composition, floristic richness and biodiversity of vegetation, before and after the intervention efforts. Moreover, data on utilization of single species were collected in order to evaluate the real consumption of each plant species by wild animals. Results confirmed the efficiency of the improvement of the studied area in terms of botanical composition and of pastoral value and they provided useful indications about the actual utilization of non forage plants by wild ungulates.

*Key words:* Wild ungulates, Pastures, Defoliation rate, Vegetal Evolution.

**Introduction** – In recent years, in many European countries the abandonment of traditional agricultural practices produced remarkable effects in marginal lands (Cervasio *et al.*, 2008). These trends are particularly evident in livestock farming, causing the decline and the popularity of grazing systems (Van den Pol-van Dasselaar *et al.*, 2008). The decrease of grazing affects in a remarkable way many important characteristics of the pastoral resources that involve botanical composition, presence of undesirable species and biodiversity (Staglianò *et al.*, 2003). As a consequence, the diffusion of intrusive species in the open areas could reduce the suitability of the pastures, not only for domestic animals but also for different kinds of wild animals such as deer and wild boar. One of the most diffuse invasive species is bracken fern (*Pteridium aquilinum*) which tends to encroach abandoned land on acidic soils and to reduce the qualitative value of intruded areas (Le Duc *et al.*, 2000). For these reasons, different methods of pasture recovery have been developed in order to improve pastoral vegetation and to enhance the forage availability in terms of dry matter production and quality, especially in protected areas (parks, oasis, etc.) where the conservation of biodiversity and the safeguard the ecotonal belt are the main means to improve the faunistic management. The aim of this work is to evaluate both the efficacy of environmental improvement against intrusive vegetation, in order to assess the restored pasture as feed resource for the wild fauna, and the effective utilization of the introduced canopy.

**Material and methods** – The research was carried out on a trial site called 'Lamaccia' which is a 2.5 ha open area located at about 1100 m asl in the Regional Park of Laghi di Suviana e Brasimone (Province of Bologna, Central Italy). In September 2004 environmental improvements, including cut-

ting of all invasive vegetation (mainly bracken fern), and ploughing and sowing of a forage species mixture suitable for the local conditions [*Bromus inermis* (30% by seed weight), *Dactylis glomerata* (30%), *Festuca ovina* (25%), *Trifolium pratense* (10%) and *Lotus corniculatus* (5%)], were performed in the study area. In the following years the sward was cut to maintain the new vegetation. Data on botanical composition (8 samples per year) were recorded in summer months from 2004 to 2008, using linear analysis according to Daget and Poissonet (1969). Botanical analysis permitted the evaluation of the specific contribution (SC), that is the percentage presence of each species in the vegetation, and the pastoral value (PV) calculated using the formula  $PV = \sum(SC_i \times SI_i) / 5$ , where *SI* is a specific index, variable from 0 to 5, which summarizes the potential value of each forage species (Cavallero *et al.*, 2002). Biodiversity was evaluated by means of the Shannon-Wiener index  $H' = -\sum p_i \ln p_i$ , where  $p_i$  is the percentage of the specific frequency in decimal fraction (Magurran, 2004), and by means of floristic richness (R), expressed like average number of species for transect. To analyse the effective use of the new pasture by wild ungulates the defoliation rate (DR) was estimated according to Orth *et al.* (1998). Data collected during the different years of trial were analysed by ANOVA using the following linear model:  $Y_{ij} = \mu + A_i + E_{ij}$ , where  $\mu$ =mean; A=year; E=error (SAS, 2003).

**Results and conclusions**

– After pasture seeding, the presence of species along time is given in Table 1. Before the agronomic works (year 2004) there was large presence of fern (SCP) whose incidence limited the presence of botanical families of fodder interest for animals, such as the legumes that are generally heliophilous plants.

A large decrease in bracken specific contribution was noticed in the years after the pasture enhancement. The increased occurrence of species belonging to families of pabular interest, such as grasses and legumes, indicated an improvement of the pasture quality, shown by a significant increase of the pastoral value trend (PV). Trends of biodiversity (H') and of species number (R) express the presence of a floristic

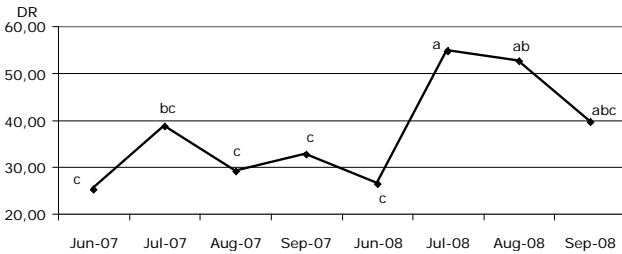
diversity interesting for both naturalistic-conservative and faunistic purposes. There were differences in pasture utilization, expressed by the defoliation rate (DR), between summer months (Figure 1); in particular the whole area utilization and the use of the herbaceous species number increased significantly in the second year (2008). In 2008 the Pastoral Value of the area decreased (Table 1), as many spontaneous species with no Specific Index (i.e. SI=0) colonized the area, which, however, were used by the wild ungulates. In fact, some species, i.e. *Galium album*, *Ranunculus acris*, *Veronica chamaedrys*, were positively selected in several months, as shown in Figure 2, where the species utilization is expressed as the ratio between the percentage of defoliation rate (DRC) of each species and its specific contribution in the pasture (DRC/SC). The results confirm the effectiveness of the environmental

Table 1. Percentage of specific contribution of sowed mixture (SCM), spontaneous species (SCS), grasses (SCG), legumes (SCL), other species (SCO) and bracken fern (SCP). Evolution of pastoral value (PV), Shannon-Weiner index (H') and floristic richness (R, number of species).

	2004	2005	2006	2007	2008
	Specific Contribution %				
SCM	0.21 c	2.01 c	21.46 a	12.03 b	11.63 b
SCS	99.79 a	97.99 a	78.54 c	87.97 b	88.37 b
SCG	21.48 b	40.55 a	35.78 a	35.77 a	26.01 b
SCL	1.08 c	8.36 c	31.15 a	28.62 ab	21.22 b
SCO	36.27 b	50.53 a	32.91 b	35.02 b	52.19 a
SCP	41.18 a	0.57 b	0.17 b	0.59 b	0.58 b
PV	12.12 c	26.39 b	41.20 a	43.93 a	30.61 b
H'	1.82 d	1.87 cd	2.24 bc	2.28 b	2.70 a
R	9 c	10 c	15 b	16 b	22 a

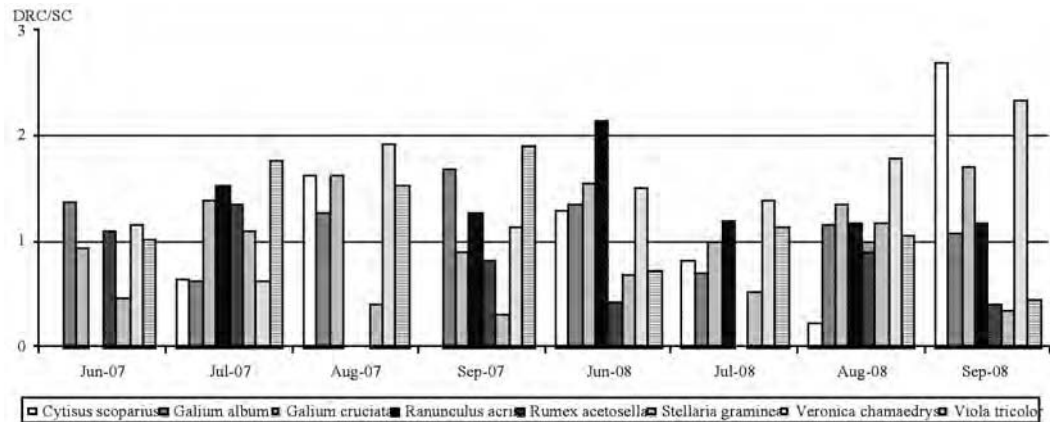
a, b, c=P<0.001.

Figure 1. Trend of defoliation rate (DR) during the months in the years.



improvement carried out, in terms of pasture quality and utilization by wild ungulates, as well as increased richness and biodiversity of the spontaneous botanic species. Thus, the management of open areas through a regular programme of pasture cutting can represent an important action for the valorization of marginal areas, increasing the food availability for wild ungulates and enhancing the botanic richness and the pasture biodiversity.

Figure 2. Utilization rate (DRC/SC) of species grazed by wild ungulates. DRC/SC < 1: species used very little in comparison to availability or even rejected; DRC/SC = 1: species consumed in proportion to presence in the pasture; DRC/SC > 1: selected species.



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