EVALUATION OF THE ITALIAN APENNINE ECOSYSTEMS WITH RESPECT TO ANATOMICAL AND ETHOLOGICAL CHARACTERISTICS OF THE ROE DEER

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Abstract: Based on a previous landscape synphytosociological analysis, the present work intends to test the degree of suitability for the roe deer (Capreolus capreolus) of the different Apennine habitats, relating the ecological and structural characteristics of the forest Apennine ecosystems (bioclimate, floristic structure and composition, food availability) with the specific anatomical characteristics of the digestive apparatus and alimentary habits of this Ungulate. Although the roe deer is a ruminant, it must be considered a grazing rather than a browsing animal that carefully selects what it ingests, choosing plants or plant parts rich in cellular sap of high protein content, and avoiding, as far as possible, plants with a high content of raw fibre. The data in hand seem to point out a range of suitability for the roe deer of the hilly and low-mountain wooded habitats, among which, nevertheless, remarkable differences in ecological and environmental level of suitability have been recorded. One of the principal limiting factors is the relationship between the availability of trophic resources present at the beginning of the autumn, and the length of the winter period (corresponding to the phase of vegetative dormancy). Also of notable importance are vegetation patches, types of forest management and the different floristic and structural characteristics of the ecotonal belts.

Introduction

The present landscape of central Italy shows different levels of human influence that are strictly related to the landform characteristics of the area. In fact, while in the Apennine zone strong natural elements are still preserved, since the higher ground is occupied by extensive pastures and the slopes by woods and shrubby areas, within the steeper hilly sector the woods alternate with agricultural areas, small uncultivated surfaces and ancient rural settlements, often fortified, which dominate the narrow valleys below [4]. Thus this is an ecologically very diverse landscape, in which numerous ecosystems with different floristic and structural characteristics alternate with one another.

Classification of these ecosystems and mapping them represent important tasks for realizing a hierarchical system of ecosystem representation, since this type of analysis can offer a rational basis for many problems inherent in land management, sustainable development and nature conservation [8, 20]. A proposal to create a hierarchy for the ecosystems for the Italian territory has been adopted by Blasi et al. [1], who affirm that ecosystems are generally identifiable on the basis
of their ecological homogeneity, in relationship to the surrounding territory. The need to establish a hierarchical scheme of ecosystem representation for the identification of the relationships between fauna and vegetation has also been demonstrated by Brandmayer et al. [2].

The methodology of landscape hierarchy lies at the basis of the publishing of the Map of the Ecosystems of the Province of Macerata (Central Italy), produced in support of animal-hunting planning with GIS [5], and mainly referring to population management of roe deer, since this species is re-colonizing the Apennines of central Italy.

The roe deer has a predominantly nocturnal life, but in winter it intensifies diurnal activity in the search for food. It can also be seen at dawn and sunset when grazing activity is more intense, with grazing periods of 2–6 hours distributed in 10–11 forays [7, 12]. The roe deer habitually frequents the edge of woods or clearings, above all after strong rains because of its perturbation by water that falls from leafy branches after storms [11].

Under optimal environmental conditions density should not exceed 8–12 units per 100 ha [12], even if in some zones of strong influx the density can be 20–25 head per 100 hectares [16, 17]. This is rarely compatible with the forestry and/or agricultural activities of the territory, nor with the maintenance of plant biodiversity and the structure of the forest ecosystems.

Concerning the ingestive system, the roe deer has a short and pointed face which helps it select plants or parts of them with great precision, and it is also helped by the presence of an arched line on the incisor teeth [14]. The roe deer possesses large salivary glands, about 25% greater than those of cattle (in proportion to their relative dimensions) [10]; this is linked to the fact that it directly carries part of the cellular sap of the plants (sugars and triglycerides) to the abomasum (glandular stomach) through the oesophageal groove; in this way it directly exploits the protein portion contained in the plants eaten.

The anatomical peculiarities of the roe deer’s digestive apparatus make it more demanding in respect of diet. It is considered a concentrated selector [3, 10] and poorly adaptable to diets low in proteinaceous substances such as raw fibres, preferring leaves, buds and wild fruits.

In this work, the data present in the Map of the Ecosystems of the Province of Macerata and the territorial hierarchical reading have been correlated to anatomical and ethological considerations related to the roe deer, with the purpose of cartographically identifying the areas mostly suitable for this ungulate.

**Material and Methods**

The Map of the Ecosystems of the Province of Macerata (scale 1:100000) represents the distribution of 33 ecosystems, arranged in 19 subsystems (Geosigmeta); these characterize the nine landscape systems (Macrogeosigmeta) present in the territory of the Province of Macerata [5].

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