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   Sommario

Agricultural landscapes are systems characterized by the co-evolution of human and natural components. In these landscapes, agriculture is considered as the factor of alteration that causes changes in landscape patterns, such as the loss of availability of semi-natural habitats, the fragmentation of the natural component of the landscape and a constant effect of perturbation. From an environmental perspective, sustainable management requires an understanding of the processes that may alter the ecosystems. This research is part of this context of investigation, and aims to assess the impact of agricultural management on biodiversity. Small mammals were chosen as ecological indicators of the effects of agricultural management on biodiversity, as they are mobile enough and live long enough to respond to different spatial and temporal scales, as well as indicative of the problems of biodiversity conservation. This work had two objectives: a) to study the communities of small mammals in agricultural areas arranged along a gradient of increasing intensity of agricultural land use; b) to study how the demographic characteristics and the fitness of populations are influenced by different types of habitat (cultivated and semi-natural) and how they are related to the composition and

configuration of landscape patterns, investigating these relationship at different spatial scales (local and landscape). Three hypotheses were tested: 1) complexity and diversity of small mammal communities decrease along a gradient of increasing agriculture intensification, corresponding to a gradient of decreasing availability of natural habitats; 2) population fitness of small mammals (measured using demographic parameters) is greater in semi-natural habitats; 3) small mammals populations are affected by the structure of the environment and by the complexity of the local mosaic of landscape. The methodological approach, as a first step, included the choice of three study areas arranged along a structural gradient, characterized by an increasing intensification of agricultural land use, which corresponds to a decreasing availability of residual semi-natural habitats (woods, hedges and meadows). An ordering analysis (Principal Component Analysis) of the class metrics representing the local landscape patterns was carried out and it showed that the main components of the dynamic gradient identified a clear distinction between cultivated areas and natural environments, both herbaceous and arboreal, in terms of the structural organization of land uses. The next step involved the study of communities of small mammals by live trapping, in three different habitat types, representative of the agricultural landscape pattern: hedges, meadows and corn fields. The results showed that in the area characterized by an intensive agricultural land use, the small mammal community is not very diversified and is dominated by the more generalist species, Apodemus sylvaticus. Another species that is also well adapted to intensively cultivated areas, Microtus arvalis, was also present in this area. In the most natural area, the community had high diversity (measured by the Shannon index and the Pielou index) and was characterized by the presence of Apodemus flavicollis, a species strictly dependent on the presence of hedges and woods. These results confirmed the first of the initial hypothesis. To study how population fitness was influenced by the environment (second hypothesis), a set of demographic parameters were related to the gradient of agricultural intensification and to the type of habitat investigated. The results supported the second hypothesis. The most natural area presented a populations that was less abundant but more stable, with individuals whose weights were greater and whose sex ratio was close to parity, typical characteristics of healthy populations. In terms of habitats, hedges did not always show the highest number of individuals, while corn fields, although only used during the summer, hosted a high percentage of reproductive individuals, with a sex ratio close to parity and with the highest weight. However, there were no significant relationships between the abundance of populations and the structural characteristics of the patches (size, length of margins, shape index and extension) and the neighboring landscape mosaic of patches (calculated as an index of landscape conservation). These results did not support the third of the initial hypotheses. This work has been organized into four general chapters: introduction of the subject (Chapter 1); objectives of the research (Chapter 2); description of the methodological approach (Chapter 3); description of the study areas (Chapter 4). These chapters are followed by three chapters of results, structured as individual papers, consisting of introduction, methods for the specific chapter, results and discussion. The three chapters of the results are 1) the description of agricultural landscape patterns and identification of the characteristics that describe the gradient of land use (Chapter 5); 2)

the study of the composition of small mammals communities along the gradient of naturalness that characterizes the study areas (Chapter 6); 3) the investigation of the population fitness and the relationships between demographic parameters and structure of habitats and agricultural landscapes (Chapter 7). At the end there is a general discussion (chapter 8).

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