

Monitoring of Orthoptera in Flemish Nature reserves: aims and preliminary results

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In 2003 we started with a monitoring scheme for species-rich grasslands (= grasslands with relic species of semi-natural grasslands) in Flemish nature reserves (N-Belgium). This monitoring includes following the effects of different kinds of management (grazing, mowing, and no management) both on the vegetation by means of permanent quadrates (PQ) and on invertebrate communities. Until very recently (1999-2002) all the sites were still in intensive agricultural use. Grasshoppers were chosen as study group, because of the associations that exist between grasshopper's species and plant community composition. Their relative abundance can be a sensitive indicator of land use and habitat's physical structure and microclimate.

The objectives of this study are to relate species density, richness and relative abundance of grasshoppers to habitat vegetation and to detect differences in grassland management. Both the vegetation and the grasshoppers in a total of 75-100 different selected sites will be sampled every 3 years. In order to detect yearly fluctuations, grasshopper's density and relative abundance will be monitored every year at 20 sites. We hope that this will give us an idea what frequency of monitoring we should use to detect yearly fluctuations (e.g. temperature).

In each grassland (19 sites) four vegetation relevés (3 x 3 m), arranged in a quadrant, were made in May or June 2003. In the quadrant the relevés are separated by a strip of one meter in order to walk around the relevé. To estimate the coverage the Londo scale (Londo 1975) was used. We also estimated the mean average height of the vegetation in August and the patchiness of the vegetation sward. In addition some physiognomic characteristics of the habitats were calculated and estimated using the Ellenberg values for humidity and nitrogen (Ellenberg et al. 1992). This was based on the value of each plant which occurred in the total of the 4 vegetation relevés in each PQ. Because of the relative homogeneity of the 4 relevés, we considered the strip of 1m of no importance. For the sampling of grasshoppers (August 2003), the four vegetation relevés, including the 1 m strip, were considered as one plot of 7x7m (= 49 m²). After we placed a very light cotton shield (1.2 m height) around the plot, all the grasshoppers were caught and placed in a plastic tube. After determination they were released in the plot.

The types of vegetation of the 19 sampling sites were *Arrhenaterion elatioris* (3x), *Cynosurion cristati* (3x), *frame community Lolio-Potentillion* (4x), *frame community Molinio-Arrhenatheretea* (2x), *frame community Calthion palustris* (2x), *Calthion palustris* (1x), *Alopecurion pratensis* (3x) and *Calthion palustris* and *Caricion nigrae* (1x). Based on the Ellenberg values, the plots are all situated along a gradient from moderately humid over humid till even wet. These values also indicate that the plots are situated between moderately nitrogen rich till nitrogen rich; only 2 plots tend to be more nitrogen poor. The height of the vegetation measures between 3 and 55 cm.

A total of 825 individuals of nine grasshopper species (*Conocephalus discolor*, *C. dorsalis*, *Tetrix subulata*, *T. undulata*, *Chorthippus albomarginatus*, *Ch. biguttulus*, *Ch. brunneus*, *Ch. montanus* and *Ch. parallelus*), were collected at the 19 sampling sites. Two species *Chorthippus parallelus* and *Ch. albomarginatus* comprised 81% of the grasshopper assemblage. Three plots were without Orthopteran species. One species, *Ch. parallelus*, occupied 15 of the 19 plots, while *Ch. montanus* was only found in one PQ. The seven other species occupied between 3 and 7 plots. Until 10 years ago *Conocephalus discolor* was a very rare species in Flanders. We found him in not less than 7 of the 19 plots by which he now occupied the second most plots. The average number of species per plot was 2.7. We found an average density of 0.89 ex/m², with a maximum of 2.43 ex/m² (= 119 individuals). If we only considered the plots where grasshoppers species were present this augmented till 1.05 ex/m².

Our preliminary results indicate a correlation between the species density and the height of the vegetation in August. A height of min. 20 cm seems necessary to find densities of min. one individual/m². Grasshoppers are almost absent in plots with a vegetation height of less than 5 cm. Presumably there tend to be a correlation between the humidity of the plots and both the density and the species richness of grasshoppers. The moderately humid and the wet plots tend to have higher density and greater species richness than the humid plots.