Entomological Monitoring

Summary

Monitoring of selected invertebrate groups was carried out at all project sites. The main objective of the monitoring was to assess the impact of management measures implemented during the project. At the Blšanský chlum project site, the monitoring also served to monitor the population of Jersey tiger (*Euplagia quadripunctaria**), which is the only object of protection of this Special Area of Conservation (SAC) and one of the target species of the project.

The invertebrate groups monitored were spiders (Araneae), orthopterans (Orthoptera), true bugs (Heteroptera), butterflies and moths (Lepidoptera), and selected families of beetles: ground and tiger beetles, weevils, leaf beetles (Coleoptera: Carabidae, Curculionidae, Chrysomelidae), and at the Panov project site also bees and wasps (Hymenoptera: Aculeata).

Data collection was ensured by a combination of methods: pit traps (spiders, orthopterans, true bugs, ground and tiger beetles), sweep netting (spiders, orthopterans, true bugs, weevils, leaf beetles), light traps (moths) and time-lapse images of diurnal butterflies, as well as Moericke (yellow) pan traps (hymenopterans). Butterflies and moths were monitored annually at all sites, while other groups were collected in the first, third and fifth years of the project. At the Pánov project site, where the most extensive management measures were implemented, all groups were collected annually. The basis for collecting material was pairs of pit traps installed and fixed in the first year of the project. The number of pit traps varied in each area according to the size of the project sites (at Blšanský chlum, Havranické vřesoviště and Mašovická střelnice 12 pairs each, at Pánov 16 pairs and at Načeratický kopec 18 pairs of traps). Traps were placed at the project sites in different habitat types and/or areas with planned and subsequently implemented management measures. Some of the traps were always placed in areas where no project activities were taking place and served as controls. Other methods were applied near the ground traps. Data collection took place three times during the season (May, June and August) in a given year, with data collection for diurnal butterflies and moths also taking place in July. Data collection was carried out by 4 staff members and 13 experts were involved in the determination of the collected material. The results were processed by statistical methods using generalized linear models for each area and habitat type/intervention separately.

The results showed different responses of the monitored taxa to the implemented management and habitat changes at individual sites. In terms of number of species, the most positive response was observed for moths. For this group, an increase in numbers was found at all monitored sites except
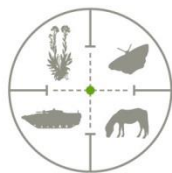
Pánov. Here, there was first a significant decrease in the number of species followed by an increase again in the last year of the project. The fluctuation is probably due to the decline of species associated with softwoods (Aspen, Birch) after extensive reduction of woody plants and gradual replacement of taxa associated with non-forest habitats. The second positively responding group was spiders, where there was also an increase in the number of species during the project at all sites except Havranické vřesoviště. Here the number of species remained approximately the same. No statistically significant differences in species numbers were found in the other groups, only at Blšanský chlum there was an increase in the number of ground and tiger beetles, and at the sites Mašovická střelnice, Načeratický kopec and Pánov there was a decrease in the number of species of weevils.

The different reactions of the observed groups to the management measures indicate that the interventions have led to an increase in environmental heterogeneity as well as the fact that the most appropriate approach to the management of abandoned military areas is to use various types of management approaches. At the same time, it is evident that the more radical interventions, like removal of woody plants and the subsequent restoration of steppe or grassland vegetation have not yet fully manifested a positive effect. Particularly in the case of Pánov, where radical and extensive restoration actions have been undertaken after a long previous period of lack of care with the negative impacts of uncontrolled succession and the rapid development of invasive and competitively strong plant species, it is only natural that restoration of the target open habitats and associated invertebrate communities requires more time.

The monitoring also showed that the management interventions undertaken at Blšanský chlum have led to an improvement of the habitat and stabilized the population of the Jersey tiger, which is one of the target species of the project.

A by-product of the monitoring was also a significant broadening of the faunistic knowledge of the species occurrence at the project sites. Besides the above-mentioned groups, faunistic data were obtained for leafhoppers (Auchenorrhyncha) and other beetles outside the three families monitored in detail. A total of 2 001 invertebrate species were identified, of which 394 species are listed on the Red List of Threatened Invertebrate Species, 29 species are specially protected and 2 species are listed in the Annexes of the Habitats Directive (*Euplagia quadripunctaria* and *Lycaena dispar)*. The high number of species of conservation importance confirms the exceptional naturalistic importance of the abandoned military training areas.