

## **Finnal summary report of monitoring, LIFE for Insects**

Over five years, it was necessary to evaluate how selected groups of organisms reacted to the interventions. Partial surveys focused on different taxonomic groups of insects (butterflies, beetles, ants, plants) were carried out in the extensive territory of Beskydy SCI, White Carpathians SCI, Čertoryje SCI, and in Slovakia in Holubyho kopanice SCI.

### **Beskydy SCI**

In Beskydy SCI, several partial surveys were conducted with two partners.

As part of the activity of the Czech Union for Nature Conservation (CUNC) Salamandr, ten previously overgrown meadow sites were managed in a targeted way. In 2018, 2020, and 2022, the size of the large blue butterfly (*Maculinea arion*) population was monitored at all sites. There was a substantial increase in population size at five sites. At three of them, there was a new settlement of the large blue and the creation of a small population; only at two of them was management not effective and the large blue did not colonize at the site. At most sites, the population of *M. arion* has developed. The reaction of the *M. arion* population at the project sites has been positive to the ongoing management in the last five years. Furthermore, in 2018, 2020, and 2022, the spectrum of host and non-host species of *Myrmica* ants was also studied in order to assess suitability of the area for the development of *M. arion* from the point of view of this limiting resource for the development of its larvae. At most sites, a suitable community of this thermophilous ant species has developed as hosts of *M. arion*. The reaction of the *Myrmica* community to ongoing management in the last five years has been positive.

As part of Beskydy PLA activities, 18 previously overgrown meadow sites were managed in a targeted way. It can be stated that there are stable populations of large blue at the selected sites and management interventions have enabled them to increase and stabilize their populations. This is also evidenced by the comparison of monitoring from 2019 and 2022. *M. arion* thus survives in a typical stable metapopulation structure and is able to occupy restored habitats. In 2022, the occurrence of the dusky large blue and the scarce large blue was newly confirmed at several wetter sites. These two species of blue butterflies were found on several great burnet plants growing on project sites. These are probably newly formed, unstable populations that came to these more isolated sites from the surrounding. A relatively stable population of clouded Apollo (*Parnassius mnemosyne*) was also confirmed at the Javornický hřeben site in the vicinity of the Portáš and Kohútka hotels. The local mountain population uses forest edges with *Corydalis*. At the same time, clearing and opening of the sites helped the spread of *P. mnemosyne* individuals to other sites.

In addition to the target species, 360 species of beetles were found in these 18 meadow sites in 2019. It was interesting to find that rare mountain species were mixed with thermophilous species at the sites, which proves how important the selected sites are for biodiversity. 95 other species of diurnal butterflies have also been recorded. Of this number, 40 species were protected or otherwise threatened. Within the Czech Republic, these numbers are relatively unique and confirm the exceptionality of the Beskydy sites.

### **Čertoryje SCI, White Carpathians SCI**

In 2020 and 2021, two partial entomological surveys focused on butterflies and beetles were carried out in White Carpathians SCI as part of White Carpathians PLA activities. As part of the project, management was carried out on 59 sites. However, surveys and comparative

monitoring were only carried out on 26 sites. The reason why monitoring was not implemented at all sites is the implementation of management interventions at the end of the project, when it was no longer possible to process initial, let alone comparative, monitoring. 720 species of beetles and 330 species of butterflies were recorded at these 26 sites. Approximately 200 species of beetles are protected by law or listed in one of the categories of the Red List of Threatened Species. The most valuable and species-rich site was Paličky, with the most species specializing in dead wood and old trees, and a number of rare species of moths. In total, 220 species of beetles were found here, including forest relicts that can only be found in very well-preserved forests. Čerešnické mlýny was a similarly important habitat. The habitats of Vápenka and Súdeňska were also valuable, with their wet meadows with a number of specialized wetland beetle species. The sites in Kopanice were poorer in species, but they are important in the expansion of the habitat of the clouded Apollo, which occurs in the area.

Populations of target project species were found at several sites. Clouded Apollo (*Parnassius mnemosyne*) was observed in 2020, 2021, and 2022 at three sites. A surprise was the discovery of *P. mnemosyne* at the site of Přední luka in Nová Lhota. Stag beetle (*Lucanus cervus*) was confirmed at five sites. In the White Carpathians, it occurs almost everywhere in stands with old trees. This also applied to the project sites. However, *L. cervus* was not recorded on most sites. This is due to its difficult and demanding monitoring. Due to the nature of the sites and their management, however, there is a high probability that it occurs at a number of them. At other sites, the occurrence of *L. cervus* is probable in the future, when a new generation of old trees is established with enough dead wood.

As part of the activity of the Czech Union for Nature Conservation (CUNC) White Carpathians, an entomological survey was carried out at four sites in Čertoryje SCI. Over 100 species of beetles were found at each site. The occurrence of *L. cervus* was confirmed at two sites in 2021 and 2022. In addition, a botanical survey was carried out here, which confirmed the importance of the interventions. After opening the sites, it became clear that the newly created open canopy middle forest hosts not only specialized forest and grove plant species, but also species of orchid meadows and pastures.

## **Holubyho kopanice SCI**

The last area where entomological surveys were carried out was Holubyho kopanice SCI on the Slovak side of the White Carpathians border. Here, as part of BROZ activity, a survey of rhopalocera butterflies took place at six sites. 81 species of butterflies were found.

As part of the survey in 2019, a smaller but stable population of clouded Apollo was found on the Nová Bošáca - Grúň II site. At the site of Bošáca – Peterková, the occurrence of dusky large blue and scarce large blue butterflies and the very rare eastern eggjar were recorded.

In 2020, a further survey of beetles, ants, and spiders was carried out. In total, 142 species of beetles, 95 species of spiders, and 37 species of ants were found. Emphasis was placed on monitoring ants of the *Myrmica* genus, i.e., the host species of the blue butterflies of the *Maculinea* genus. The host species of the so-called great burnet blues were found at all sites. *Myrmica sabuleti*, i.e., the host species of *M. arion*, was recorded only at two sites. It is highly probable that through the gradual development of vegetation (succession) and appropriate management, ants of the *Myrmica* genus will spread to the remaining sites as well.

In 2022, a further survey of beetles, ants, and spiders was carried out. In total, 235 species of beetles, 51 species of spiders, and 39 species of ants were found. Emphasis was placed on monitoring ants of the *Myrmica* genus, i.e., the host species of the blue butterflies of the *Maculinea* genus. The host species of the so-called great burnet blues were found at all sites.

*Myrmica sabuleti*, i.e., the host species of *M. arion*, was recorded only at two sites. It is highly probable that through the gradual development of vegetation (succession) and appropriate management, ants of the *Myrmica* genus will spread to the remaining sites as well.

### **Assessment of habitat status**

The development of target species habitats was assessed at all sites based on to a uniform methodology. We did not directly monitor the target species populations, but the potential suitability of the habitat based on the experience of experts for the given species.

A total of 59 sites and four different habitats were evaluated as part of Action C1. For the large blue, four sites were evaluated that were relatively suitable. The habitat for dusky large blue and scarce large blue was monitored at five sites that are suitable for both species. 29 sites were evaluated for the stag beetle, which are currently mostly suitable for the development of its larvae after management has been carried out, or will be suitable in the future due to gradual succession (old trees or micro-habitats with dead wood). A total of 27 sites have been evaluated for the clouded Apollo that are suitable for its development; however, further management and an increase in the size of the surrounding populations are necessary for them to occupy the newly created migration habitats.

A total of six sites and two habitats were evaluated as part of Action C2. One site was evaluated for the large blue, which is currently rather unsuitable for the development of its population. Six sites were evaluated for the stag beetle, which are mostly suitable for its development, but further management is necessary.

A total of ten sites were evaluated as part of Action C3, all of which were almost ideal habitats for the large blue with confirmed occurrence of the species.

A total of 18 sites and three different habitats were evaluated as part of Action C4. 17 sites were evaluated for the large blue. A positive trend is evident. Currently, the sites are suitable for the development of *M. arion* populations. The habitat for dusky large blue and scarce large blue was monitored at five sites which are currently suitable for both species. One site was evaluated for clouded Apollo, which is suitable for its development. However, it is necessary to continue with management in the future.

Comparison of the development of habitat status at all sites showed that, at the end of the project, the condition of the vast majority of restored habitats had improved compared to previous years and is suitable or potentially suitable for the development of target insect species in the future.

### **Summary**

Stable and increasing populations of target species were recorded in Beskydy SCI. In White Carpathians SCI, Čertoryje SCI, and Holubyho kopianice SCI, the target species were observed only in a few newly created areas. Nevertheless, it is probable that the target species will reach the newly formed habitats in the future, when suitable conditions for their survival will gradually be created. It is also evident from the surveys presented that interventions to support target species have benefited biodiversity and very rare and specialized insect species are found on the sites.