

SUMMARY

"Post-industrial areas as potential refuges communities of Aculeata (Hymenoptera: Apocrita: Aculeata)"

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The Świętokrzyskie voivodeship, and especially the areas in the vicinity of Kielce abound in places where utility rock and sand are extracted. Exploitation of raw materials such as quartzite, dolomite or limestone has ceased on some of these areas. Since the abandonment of further extraction of the material the areas start to be subjected to natural plant and animal succession. Then, ecosystems are created that are completely different from the surrounding, that is forests, meadows, swards. The places, deprived of the human impact on the environment, can become the secondary refugia for various groups of organisms such as Aculeata.

The aim of the study was to verify if and to what extent the post-industrial areas (quarries and sandpits) can become the secondary refugia for the wildy living species of Aculeata. The research on wildy living Aculeata has been conducted within the period from 2012 to 2014. The research material was collected from the beginning of April to mid-October at two-week time intervals using the method of Moericke's traps. It was obtained from three unused quarries and three unused sandpits located in the area of the Świętokrzyskie voivodeship. A fresh meadow located in the town of Kajetanów was the testing surface. The material was analyzed in terms of zoocenosis, zoogeography and phenology.

The zoocenosis analysis included the testing of quantitative, qualitative and quantitative-qualitative parameters. To this end, adequate indicators were used. Dominance structure was used for the first parameter, number of species was used for the second one, and the SHANNON-WIENER'S (H'), SIMPSON'S (D) and HURLBERT'S (PIE) and PIELOU'S (J') indexes were used for the third one. The value of the H' index was the highest for the complex of Aculeata from the sandpit in Borowa Góra and it slightly exceeded the complex of Aculeata from the testing surface (fresh meadow). The other complexes, except for the sandpit in Małocice (the lowest diversity), have indexes with slightly lower values. The D and PIE and J' indexes had a similar distribution of values. The first two show that the complex of Aculeata from the sandpit in Borowa Góra was characterized by the greatest diversity, which was equal to the testing surface,

Król

while the others (except for the sandpit in Mąchocice) had a slightly lower diversity. The last index shows that the complex from the sandpit in Suchedniów has the greatest diversity, while a minimally lower diversity is found in the sandpit in Borowa Góra and on the fresh meadow. The complexes of quarries had diversity that was very similar to one another, only slightly lower than the complex on the testing surface and in the sandpit in Borowa Góra and Suchedniów.

In order to know the degree of similarity between the complexes of Aculeata in the tested sandpits and quarries and the fresh meadow, the indexes that compare their qualitative and qualitative-quantitative parameters were applied. The first ones included the MARCZEWSKI-STEINHAUS (*MS*) and SORENSEN (*QS*) indexes, while the other ones included the CODY (*T*) index. The *MS* and *QS* indexes showed that the degree of faunistic similarity of the complexes of Aculeata from the tested surfaces is very similar to the complex from the fresh meadow. Among them, the sandpit in Borowa Góra and the quarry in Kostomłoty demonstrate the greatest similarity to the testing surface. The complexes of the quarry in Masłów and the sandpit in Suchedniów are the most similar to the complex of the fresh meadow in terms of the qualitative-quantitative parameter. Slightly lower similarity to the testing surface is found in the complexes of the quarry in Zachełmie and the sandpit in Borowa Góra. Clearly lower values of the CODY INDEX were obtained for the complexes from the quarry in Kostomłoty and the sandpit in Mąchocice.

A statistical analysis showed significant differences between the complexes in individual quarries. The differences are also found between the complexes of Aculeata in individual sandpits, whereas there are no significant statistical differences between the complexes of Aculeata from individual test surfaces and the complex of Aculeata from the testing area.

The fauna of Aculeata in the tested material belonged to eleven zoogeographical elements. Most numerous in the unused quarries and sandpits were Palearctic species, followed by Western Palearctic and European ones. Other zoogeographical elements were represented in lower quantities. Aculeata belonging to three phenological groups were found on the tested surfaces, in which early-spring species were dominating, followed by summer and late-spring ones.

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