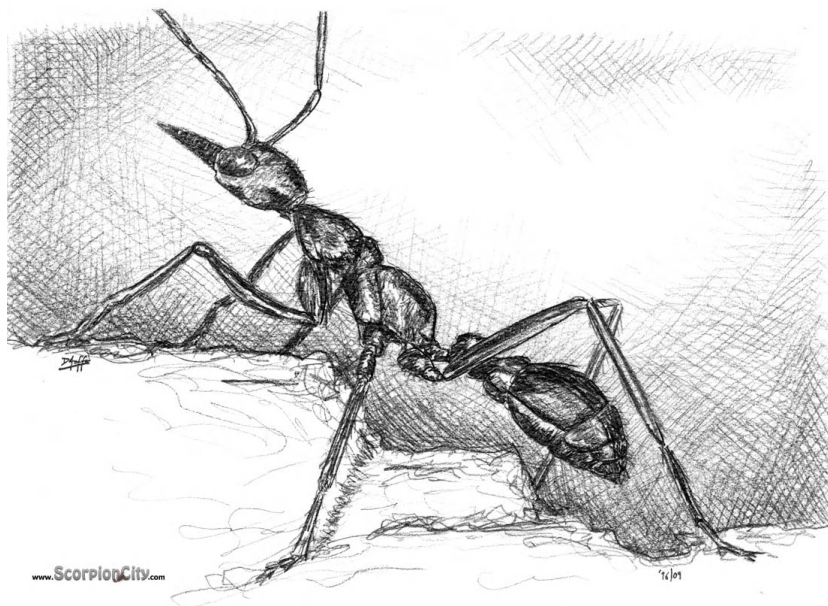


Taxonomic and faunistic investigation of ants (Hymenoptera: Formicidae) in the Carpathian Basin



Császár Sándor

supervisor: Prof. László Gallé DSc
Department of Ecology
Szeged
2006

1. INTRODUCTION AND OBJECTIVES

My main interest is the taxonomy, systematics and biogeography of ants (Hymenoptera: Formicidae). For my doctoral thesis I chose to clarify three, problematic groups namely, the subfamily Ponerinae, the further genera *Myrmica* and *Tetramorium* belonging to the subfamily Myrmicinae.

Hungarian myrmecology has been rather neglected for a long time. Today, one of the most important tasks is the faunistical and taxonomical investigation of the ant fauna of Hungary and the Carpathian Basin, which is essential mainly for further ecological research.

My doctoral thesis comprises four independent projects:

- I. According to some authors, the European representatives of this genus comprised a “finished group” in the '90s, but in the last few years several new problem arose (SEIFERT 2002a, STEINER *et al.* 2006). These problems are mostly nomenclatural and taxonomical uncertainties. In the Hungarian context, serious difficulties arose in determination, especially in the genus *Myrmica* due to a few works (KUTTER 1977, COLLINGWOOD 1979, SEIFERT 1988) which comprise only a part of the species occurring in the Carpathian Basin. Due to the fact I decided to prepare a Hungarian *Myrmica* key, which includes the Hungarian species, and a few prospective species, which probably show up in the forthcoming years.
- II. The subfamily Ponerinae is one of the species-rich subfamilies, containing ca. 1300 species in the World with 42 genera and almost 40 species occurring in the Palaearctic Region. Taxonomic uncertainties have been hiding within this group, because these species are so monomorphic hence the intra- and interspecific variance is very difficult to detect. While writing my doctoral thesis two papers were published. At the first step, a redescription, rank elevation, and lectotype designation of the neglected taxon *Ponera coarctata* var. *testacea* EMERY, 1895 were published, in the next paper an identification key and descriptions were prepared.
- III. To carry out a modern taxonomic revision of Western Palaearctic members of the genus *Tetramorium* MAYR, 1855: this genus is one of the most diverse ant genera comprising more than 400 species world-wide (BOLTON, 1995a). BOLTON (1976, 1977, 1979 and 1980) carried out modern taxonomic revisions of this genus for all zoogeographical regions except for the Palaearctics, while taxonomic survey of this latter region is far from complete. That's why I have begun a taxonomic revision of genus *Tetramorium*, by species groups. Two papers were published (CSÖSZ & MARKÓ 2003, CSÖSZ *et al.* in press) as a part of my doctoral thesis.
- IV. Faunistic survey, check list of the Hungarian ant species. Mayr (1856) wrote a pioneer publication on the Hungarian ant fauna. Later, MOCSÁRY (1918) and SOMFAI (1959) gave a comprehensive inventory and key, respectively. As the myrmecological activities have been rapidly increasing in Hungary, many new species were found for the country, and the vast majority of them was not

published at that time when the check-list in question (GALLÉ et al. 1998) was published. The principal aim of that paper was to give a present status list on the known ant species in Hungary. As a result that paper listed altogether 101 ant species from the present territory of Hungary, since the latest complete list (SOMFAI 1959) recorded 66 taxa from our country the growth was 35 species in the last 40 years. After the above mentioned check-list (GALLÉ et al. 1998) several species were found in the territory of Hungary and in the Carpathian Basin, that's why it is necessary to update the former list. In the last chapter of my thesis I give a list of known ant species in the Carpathian Basin with synonyms and the references of localities.

2. MATERIAL AND METHODS

2.1 *Material examined*

I have been working on ants since 1996. During the last ten years I collected material from countries are as follows: Hungary, Croatia, Romania (Transylvania and Dobrogea), Germany, Russia (North Caucasia). I collect nest series, which includes several workers, gynes and males from the same nest. In this case the identification of sexuals and workers is available.

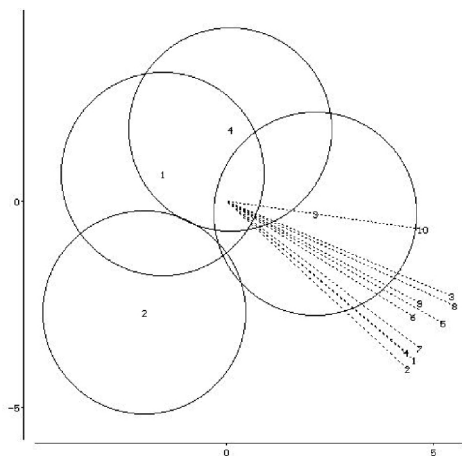
I worked on collection of altogether 25 institutes, and I got material (both, mounted and alcohol preserved) from my colleagues as well.

2.2 *Morphometric methods*

In my work the morphometry belongs to the most important methods in recognition, determination and description. The morphometric methods although widely used in the European ant taxonomical literature (ELMES & THOMAS 1985, WEHNER 1983, SEIFERT 1999, 2000a, 2000b, 2002b etc.), in the Hungarian practice it is a novelty.

This method has several advantages; objective, the results, are easy to prove and compare, direct comparison of the types and examined non-type specimens is feasible, measurements are repeatable.

In the metrical investigation and analysis we prove the hypothesis, if there is any difference between the provisional groups, and it may prove that the groups form discrete entities according to the taken metric



character combinations.

With morphometric investigation the probability of determination and classification is increasing further, the results can statistically be proved. The above-mentioned method gave the backbone in carrying out of the following projects. The number of taken variables (characters) are different by groups in question. In the case of *Myrmica* species I used 17 characters and thousand specimens were examined; in *Ponera* species 10 characters of 477 specimens; in case of *Tetramorium chefskoti* species-complex it was 21 variables and taken on 625 specimens.

All measurements are given in μm . Due to some newly introduced metric characters it was necessary to test the repeatability of measurements. All variables have been measured twice for 14 randomly chosen ant specimens, the average measures of intraclass correlation coefficient (R) were calculated. Morphometric investigation is restricted to workers and gynes.

3. RESULTS AND DISCUSSION

- I. Prepared a key to the Hungarian species of the genus *Myrmica*. The known species in our country was increased from 7 to 12, while one species was deleted from the Hungarian ant fauna due to erroneous determination. Two further species were mentioned as prospective elements, based on their distributional data appearing in the literature. Recently 17 known *Myrmica* species occur in the Carpathian Basin, all of them (except *Symbiomyrma karavajevi* ARNOLDI, 1930 [= *Myrmica karavajevi*: BOLTON 2003 new combination] appear in the key. New primary characters, new morphometric characters were added to the descriptions, to improve the probability of determinations, particularly of the populations occurring in the Carpathian Basin.
- II. The subfamily Ponerinae. At the first step, a redescription, rank elevation, and lectotype designation of the neglected taxon *Ponera coarctata* var. *testacea* EMERY, 1895 were published. Two different morphometric approaches resulted in a clear separation of *testacea* from its sister species *coarctata* (LATREILLE, 1802). *P. testacea* is abundant in the Mediterranean region but is also widely distributed in Central Europe where it spreads north to 51° 30' N. It is more xerothermophilic than *coarctata* and seems to avoid shaded, more mesophilic woodland habitats. In the next paper an identification key and descriptions were published. This paper contains five *Ponerinae* taxa, four genera with five species of the Carpathian basin. Only three taxa of them were known from Hungary until the last year. *Cryptopone ochraceum* (MAYR 1855) a representative species of a new genus for the Hungarian ant fauna is also presented in the course of this work. A key for identifying them on the basis of workers, gynes and males are included.
- III. To carry out a modern taxonomic revision of Western Palaearctic members of the genus *Tetramorium* MAYR, 1855: Two papers were published (CSÖSZ & MARKÓ 2003, CSÖSZ et al. in press) as a part of my doctoral thesis. As a first step, a lectotype designation and a redescription were given for *Tetramorium*

hungaricum RÖSZLER, 1935, a Central European taxon. It is shown that this species can be reliably separated from three related morphospecies, i.e., *T. caespitum* (LINNAEUS, 1758), *T. ferox* RUZSKY, 1903, *T. semilaeve* ANDRÉ, 1881, using morphological characters. Diagnostic characters, both morphological and morphometric, are given for the four species. Later, the taxonomic status of 10 species of the Palearctic *Tetramorium chefketi* species complex is discussed, and several nomenclatural problems are clarified. Three new species, *Tetramorium exile* CSÖSZ & RADCHENKO n. sp., *T. sanetrai* SCHULZ & CSÖSZ n. sp., and *T. anatolicum* CSÖSZ & SCHULZ n. sp. are described. *Tetramorium caespitum* var. *sarkissiani* FOREL, 1911 n. syn., *Tetramorium turcomanicum* SANTSCHI, 1921 n. syn., *Tetramorium taurocausicum* ARNOLDI, 1968 n. syn. are synonymized with *Tetramorium chefketi* FOREL 1911; *T. biskrensis kahenae* MENOZZI, 1934, n. syn. is synonymized with *T. alternans* SANTSCHI, 1929; *T. karakalense* DLUSSKY & ZABELIN, 1985, n. syn. is synonymized with *Tetramorium sulcinode* SANTSCHI, 1927. Three taxa, *T. sulcinode* SANTSCHI, 1927, *T. rhodium* EMERY, 1922 and *T. annectens* PISARSKI, 1969 are revived from synonymy. Lectotypes of *T. chefketi* FOREL, 1911 and its junior synonym *T. caespitum* var. *sarkissiani* FOREL, 1911, *T. sulcinode* Santschi, 1927, *T. alternans* SANTSCHI, 1929 and its junior synonym *T. biskrensis kahenae* MENOZZI, 1934 are designated. Gynes and males of *T. sulcinode*, *T. annectens* and *T. alternans* are described for the first time. An identification key to the workers and gynes of the Palearctic species of the *cheketi* species complex is given. 71 SEM photos and two tables with metric characters for workers and gynes of all discussed species are provided.

- IV. Faunistic survey, check list of the Hungarian ant species. As a result the first Hungarian check list (GALLÉ et al. 1998) listed altogether 101 ant species from the present territory of Hungary, since the latest complete list (SOMFAI 1959) recorded 66 taxa from our country the growth was 35 species in the last 40 years. The update list give a figure of 128 known ant species in the Carpathian Basin, belonging to 35 genera and 5 subfamilies. Eight species were not published from the Carpathian Basin up to now.

ACKNOWLEDGEMENT

With many thanks I acknowledge the contribution and the support of Dr. László Gallé and my coauthors, especially Dr. Bálint Markó. I am very grateful to the preparators of the Hymenoptera collection for their valuable work and Katalin Köváry for her patience and contribution while writing my doctoral thesis.

PUBLICATIONS RELATED TO THE THESIS

- CSÖSZ, S. (1999): *A Myrmica genus (Hymenoptera; Formicidae) hazai és várható fajainak határozoója.* – Diplomamunka, Debreceni egyetem, Debrecen, 64 pp.
- CSÖSZ, S. (2000): Hangya-faunisztikai adatok a Körös-Maros Nemzeti Parkból: A mályvádi erdők [Ant-faunistical investigations in the Körös-Maros National Park: the Mályvád-Forests] – *Crisicum* 3: 183–187.
- CSÖSZ, S. (2001): Taxonomical and distributional notes on two new and a rare *Leptothorax* Mayr, 1855 species for the Hungarian ant fauna (Hymenoptera, Formicidae) – *Annales Historico-Naturales Musei Nationalis Hungarici*, 93: 99–106.
- CSÖSZ, S. (2003): A key to the Ponerinae species of the Carpathian Basin (Hymenoptera: Formicidae) – *Annales Historico-Naturales Musei Nationalis Hungarici*, 95: 147–160.
- CSÖSZ, S., MARKÓ, B. (2004): Redescription of *Tetramorium hungaricum* Rösler, 1935 a related species of *T. caespitum* (Linnaeus, 1758) (Hymenoptera: Formicidae) – *Myrmecologische Nachrichten* 6: 49–59.
- CSÖSZ, S., MARKÓ, B. (2005) European Ant Species (Hymenoptera: Formicidae) in the Ant Collection of the Natural History Museum of Sibiu (Hermannstadt/Nagyszeben), Romania II. Subfamily Formicinae – *Annales Historico-Naturales Musei Nationalis Hungarici*, 97: 225–240
- CSÖSZ, S., MARKÓ, B., & GALLÉ, L. (2001): Ants (Hymenoptera: Formicidae) of Stana Valley (Romania): Evaluation of the effectiveness of a myrmecological survey – *Entomologica Romanica*, 6 (2002): 121–126.
- CSÖSZ, S., MARKÓ, B., KISS, K., TARTALLY, A., & GALLÉ, L. (2002): The ant fauna of the Fertő-Hanság National Park (Hymenoptera: Formicoidea) – *The fauna of the Fertő-Hanság National Park, Hungarian Natural History Museum, Budapest*, (2002): 617–629.
- CSÖSZ, S., RADCHENKO, A. & SCHULZ, A.: Taxonomic revision of the Palaearctic *Tetramorium chefketi* species complex (Hymenoptera: Formicidae). – *Zootaxa* [elfogadva], X: x–xx.
- CSÖSZ, S., SEIFERT, B. (2003): *Ponera testacea* Emery, 1895 stat. n. – a sister species of *P. coarctata* (Latreille, 1802) (Hymenoptera, Formicidae) – *Acta Zoologica Academiae Scientiarum Hungaricae* 49 (3): 201–214.
- CSÖSZ, S., TARTALLY, A. (1998): Adatok a Körös-Maros Nemzeti Park hangyafaunájához [Data to the ant fauna of the Körös-Maros National Park] – *Crisicum*, 1: 180–194.
- GALLÉ, L., CSÖSZ, S., TARTALLY, A. & KOVÁCS, É. (1998): A check list of Hungarian ants – *Folia Entomologica Hungarica* 59: 213–220.
- MARKÓ, B., CSÖSZ, S. (2001): Nine new ant species in the Romanian fauna (Hymenoptera: Formicidae): morphology, biology and distribution – *Entomologica Romanica*, 6 (2002): 127–132.
- MARKÓ, B., CSÖSZ, S. (2002): Die europäischen ameisenarten (Hymenoptera: Formicidae) des Herrmannstädter (Sibiu, Rumänien) Naturkundemuseums I.:

Unterfamilien Ponerinae, Myrmicinae und Dolichoderinae – *Annales Historico-naturales Musei Nationalis Hungarici*, 94: 109–121.

- TARTALLY, A., CSÖSZ, S. (2004): Adatok a Maculinea boglárkalepkék (Lepidoptera: Lycaenidae) kárpát-medencei hangyagazdairól [Data on the ant hosts of the Maculinea butterflies (Lepidoptera: Lycaenidae) of Hungary.] – *Természetvédelmi Közlemények*, 11: 309–317.

OTHER PUBLICATIONS

- EVERETT, S., WORGAN, A. D. P., SIELEZNIEW, M., STANKIEWICZ, A., NASH, D. N., WYNNE, I., NOWICKI, P., TARTALLY, A., PEREGOVITS, L., TESAR, D., MAES, D., WYNHOF, I., ANTON, C., MUSCHE, M., BONELLI, S., WARDLAW, J. C., CSÖSZ, S., SIMCOX, D. J., ELMES, G. W., WOYCIECHOWSKI, M., VARGA, Z., SETTELE, J., THOMAS, J. A. & SCHÖNROGGE, K. (2005): *Variation in chemical profiles of Maculinea and their Myrmica hosts across Europe*. In: Settele, J., Kühn, E. & Thomas, J. A. (eds): *Studies on the ecology and conservation of butterflies in Europe Vol. 2. Species ecology along a European gradient: Maculinea butterflies as a model*, pp. 174–177.
- GALLÉ, L., MARKÓ, B., KISS, K., KOVÁCS, É., DÜRGÖ, H., KÖVÁRY, K., CSÖSZ, S. (2005): *Ant fauna of Tisza river basin (Hymenoptera: Formicidae)* – in Gallé, L. eds: *Vegetation and Fauna of Tisza River Basin I. Tiscia monograph series*, 7: 149–197.
- MARKÓ, B., SIPOS, B., CSÖSZ, S., KISS, K., BOROS, I. ÉS GALLÉ, L. (2006): A comprehensive list of the ants of Romania (Hymenoptera: Formicidae). – *Myrmecologische Nachrichten* 9: 65–76.
- PRONDVAL, E., KASSAI, F., CSÖSZ, S., ÁRNYAS, E., BERECKZI, J., TÓTH, A., VARGA, Z., PEREGOVITS, L. ÉS KIS, J. (2005): *Oviposition of Maculinea alcon butterflies*. In: Settele, J., Kühn, E. & Thomas, J. A. (eds): *Studies on the ecology and conservation of butterflies in Europe. Vol. 2. Species ecology along a European gradient: Maculinea butterflies as a model*, p. 82–83.
- SCHLICK-STEINER, B.C., STEINER, F.M., KONRAD, H., MARKÓ B., CSÖSZ, S., HELLER G., FERENCZ, B., SIPOS B., CHRISTIAN, E. ÉS STAUFFER, C. (2006): More than one species of *Messor* harvester ants (Hymenoptera: Formicidae) in Central Europe – *European Journal of Entomology* 103: 469–476.
- TARTALLY, A., CSÖSZ, S. (1999): Blaskovics-pusztai gyepek értékelése a rajtuk talált hangyaközösségek (Hymenoptera: Formicidae) alapján [The evaluation of the Blaskovics-pusztas' grasslands and their ant (Hymenoptera: Formicidae) communities] – *Crisicum*, 2: 133–140.

