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Classification of the drepanosiphine aphids (Hemiptera, Aphidoidea: Phyllaphidinae, Calaphidinae) in the light of anatomical research*

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Abstract. The structure of the male reproductive system of 3 drepanosiphine aphid species, *Myzocallis carpini* (Koch, 1855), *Myzocallis coryli* (Goeze, 1778), and *Phyllaphis fagi* (Linne, 1767), is discussed. The histological analysis of the structure of the male reproductive system (paraffin method, semi-thin sections and total preparation) have been used to supplement morphological data in order to explain the taxonomy of these aphids.

Key words: classification, the male reproductive system of aphids, Phyllaphidinae, Calaphidinae.

INTRODUCTION

Classification of the drepanosiphine aphids, one of the largest and most diverse aphid groups, is still far from settled. The status of particular taxa, especially at the subfamily and tribe level, is flexible, various aphid genera are included or omitted from this group of aphids (e.g. Borner 1952; Bodenheimer & Swirski 1957; Shaposhnikov 1964; Stroyan 1977) and, more often than not, the authors do not provide any criteria for this division.

Among more recent approaches, based on phylogenetic characters, Heie (1987) divides the family Drepanosiphidae (1980, 1982) into 3 subfamilies: Drepanosiphinae, Phyllaphidinae and Chaitophorinae. In contrast, Quednau (1999, 2003), referring to the classification of aphids proposed by Remaudiere & Remaudiere (1997), divides drepanosiphine aphids into 12 subfamilies (Mindarinae, Neophyllaphidinae, Lizeriinae,

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Israelaphidinae, Taiwanaphidinae, Pterastheniinae, Spicaphidinae, Macropodaphidinae, Saltusaphidinae, Phyllaphidinae, Drepanosiphinae, Calaphidinae). In comparison with HEIE's classification, the subfamily Chaitophorinae is excluded from, and the subfamily Mindarinae included in, the drepanosiphine aphids; moreover, the range of the subfamily Phyllaphidinae is different.

Anatomical analysis based chiefly on the changes in the structure of the male reproductive system has been successfully employed to verify views on the classification of aphids. Earlier researches into the structure of this systems of the drepanosiphine aphids have shown distinct developmental trends among particular subfamilies (GŁOWACKA et al., 1974; WIECZOREK & WOJCIECHOWSKI 2001), suggested a close relationship between Drepanosiphinae and Chaitophorinae (WIECZOREK & WOJCIECHOWSKI 2004), and identified a number of shared characters in the structure of the male reproductive system of Calaphidinae (WIECZOREK 2006).

The present research – histological structure and ultrastructure (in preparation) of selected species of drepanosiphine aphids, as a supplement to morphological data traditionally used in taxonomy – aims at better understanding of evolutionary relationships among these aphids.

MATERIAL AND METHODS

Adult males of *Myzocallis carpini* (KOCH, 1855), *Myzocallis coryli* (GOEZE, 1778) and *Phyllaphis fagi* (LINNE, 1767) were collected in the vicinity of Katowice in October 2006. For a plane reconstruction and histological analysis of the male reproductive system of the studied species, the paraffin method (sections of 5-6 μm) and Epon – 812 - immersed material in semi-thin sections (0,7 μm) were used. A series of microtome slides was prepared, as well as total preparations of the male reproductive system. Material was analysed under the light microscope Olympus BX 60, the research was documented by photographs and drawings.

RESULTS AND DISCUSSION

The structure of the male reproductive system of *M. carpini* and *M. coryli* is similar: each of the paired testes *(testes)* consists of 3 follicles which are strongly elongated, 375-625μ long and 70-175μ wide, and overlapping. Vasa deferentia (*vasa deferentia*) run separately along their length (1014μ), their walls cling together only in the proximal part. The ejaculatory duct is reduced, the outlets of accessory glands and vasa deferentia open to it separately. The main difference is in the size and the position of accessory glands *(glandulae accessoriae)* - in *M. coryli* they are much longer (1014μ) than in *M. carpini*, and asymmetric. This kind of structure resembles the male reproductive system of another representative of the same genus, *Myzocallis (Lineomyzocallis) walshii* (MONELL, 1879), which is a Nearctic species lately introduced to Europe. Moreover, it is similar to the structure of this system in other described species of the subfamily Calaphidinae (Phyllaphidinae sensu HEIE 1982) (WIECZOREK 2006).

The male reproductive system of *P. fagi* is marked by 3 short, lobate follicles in a testis (475-741µ long and 140-234µ wide), arranged in a rosette. Vasa deferentia run separately, their walls cling together only in the proximal part, they are expanded in 2/3 of their length. Accessory glands are club-shaped and elongated (585-624µ); the ejaculatory duct is reduced. Heie (1982) has placed this species in the tribe Phyllaphidini and subfamily Phyllaphidinae. Although Remaudiere & Remaudiere (1997) and Quednau (1999, 2003) have also classified it in the subfamily Phyllaphidinae, the range of this subfamily in their view is different from that in Heie's classification. Thus, it seems an urgent task to verify views on the taxonomic position of these species and on the range of the subfamily Phyllaphidinae. It is hoped that, on the basis of morphological characters and anatomical data (in particular histological structure and ultrastructure - Wieczorek & Świątek in preparation), it will be possible to identify the actual phylogenetic relationships as well as the universal classification of this large group of aphids.

REFERENCES

Bodencheimer, F. S., Swirski E., 1957. The Aphidoidea of Middle East. The Weizmann Science Press of Israel. Jerusalem: 1-370.

Borner, C. B., 1952. Europae centralis Aphides. Mitt. Thurin. Bot. Ges., Naumburg, 3, I – II: 1-484.

Głowacka, E., Klimaszewski, S.M., Szelegiewicz, H., Wojciechowski, W., 1974. Uber den Bau des mannlichen Fortpflanzungssystems der Aphiden (Homoptera, Aphidoidea). Ann. U.M.C.S., Sec. C., **29**: 133-138.

Heie, O., 1980. The Aphidoidea (Hemiptera) of Fennoscandia and Denmark. I. General Part. The families Mindaridae, Hormaphididae, Thelaxidae, Anoeciidae, and Pemphigidae. Fauna Ent. Scand, Klampenborg, Vol. **9**: 1-235.

—, 1982. The Aphidoidea (Hemiptera) of Fennoscandia and Denmark. II. The family Drepanosiphidae. Fauna Ent. Scand., Klampenborg, Vol. **11**: 1-175.

Karwańska, J., 1981. Rewizja europejskich gatunków z rodzaju *Betulaphis* Glend. Manuskrypt pracy doktorskiej, Uniwersytet Ślaski, Katowice: 1-87.

Quednau, F.W., 1999. Atlas of the Drepanosiphine aphids of the world. Part I *Panaphidini* Oestlund, 1922, *Myzocallidina* Borner, 1942 (1930) (Hemiptera, Aphididae: Callaphidinae) American Entomological Institute, **31**, 1: 1-232.

—, 2003. Atlas of the Drepanosiphine aphids of the world. Part II: *Panaphidini* Oestlund, 1923 – *Panaphidina* Oestlund, 1923 (Hemiptera, Aphididae:Callaphidinae) American Entomological Institute, **72**:1-301.

Remaudiere, G., Remaudiere, M., 1997. Catalogue of the world's Aphididae (Homoptera,Aphidoidea). INRA Editions. Versailles: 1-473.

Shaposhnikov, G. CH. 1964. Podotrjad Aphidinea – tli. In*:* Opredelitel' nasekomych Evropejskoj casti SSSR. Moskwa-Leningrad, **1**: 489-616.

Stroyan, H. L. G. 1977. Homoptera Aphidoidea (part): Chaitophoridae and Callaphididae. Handbook for identification of the British insects, London, **2** (4a): 1 -130.

Wieczorek, K., Wojciechowski, W., 2001. Developmental trends of Drepanosiphidae (Homoptera, Aphidinea) in the light of anatomy research. Aphids and other Homopterous Insects, **8**: 27-34.

—, 2004. The systematic position of Chaitophorinae (Hemiptera, Aphidoidea) in the light of anatomy research. Ins. Syst.& Evol., **35**: 317-327

Wieczorek, K., 2006. Anatomical investigations of the male reproductive system of five species of Calaphidinae (Hemiptera, Aphidoidea). Ins. Syst.& Evol., **37**: 457-465.