

BEES (HYMENOPTERA: APIDAE) COLLECTED IN SĂLAJ COUNTY (ROMANIA) AND THEIR SYNBIOLOGICAL RATING

Lajos Tanács^{1*}

¹University of Szeged, Faculty of Agriculture, Hódmezővásárhely, Hungary

ABSTRACT: Collections were made in 2014-2015 in Sălaj County, Romania resulting 168 Apidae specimens, belonging to 55 species. While the majority of them are common species, *Andrena congruens* Schmiedeknecht, 1883, *Lasioglossum quadrisignatum* (Schenk, 1853), and *Chelostoma grandis* (Nylander, 1852) are very rare species in the Carpathian Basin. Another rare species in Sălaj County were *Lasioglossum pallens* (Brullé, 1832), *Chelostoma campanularum* (Kirby, 1802), *Chelostoma foveolatum* (Morawitz, 1868), *Osmia leucomelaena* (Kirby, 1802), *Melecta albifrons* (Förster, 1771), *Nomada platythorax* Schwarz, 1981, and *Bombus argillaceus* (Scopoli, 1763). As for zoogeographical evaluation, the main species forming the Apidae assemblages were the widely spread Palaearctic species, as well as Mediterranean elements (Holo-Mediterranean, North Mediterranean, Ponto-Mediterranean). When evaluating the swarming dynamics of bees bivoltine species with long flying period seemed to be the most significant community components. Regarding the ecological or climate endurance characteristics euryoecious eremophilous species appeared to be the most significant.

Keywords: faunistics, zoogeographical character, flying dynamics

INTRODUCTION

The bees (Hymenoptera: Apidae) pollinate many flowering plants, thus they ensure seed formation and the maintenance of many species; therefore they are an essential line of natural resources. Preserving their diversity ensures the survival of flowering plants and an essential element of sustainable agriculture (Eardley, 2001, Raw, 2001).

With the development of agriculture and agrotechnology the essential food sources via pollen and nectar producing of flowering plants rely on wild bees. Thus, the significance of research in ruderal areas and those with approximate natural conditions is increased. Sălaj County is among these areas.

Taxonomical and synbiological evaluation of the *Hylaeus* species follows the work of Dathe (1980), for determining Andreninae species the work of Oszicsniuk (1977), Oszicsniuk *et al.* (1978) and Dilewska (1987) were used. The studies of Kocourek (1966) and Móczár *et al.* (1972) gave important information for the ecological evaluation of certain Andreninae species. The evaluation of the species in the *Nomada* genus was based on the study of Móczár *et al.* (1968). Ebmer's revisions (1969-1971) were used to identify and ecologically evaluate the species of *Halictus* and *Lasioglossum*. The determination of the species belonging to Melitinae, Megachilinae and Anthophorinae was greatly aided by the works of Scheuchl (1995, 1996); based on his research in lucerne (alfalfa) Benedek (1968) divided wild bees into four main categories according to their flight time. Apidae can be divided into four groups based on weeds blooming and producing nectar in the vegetation period (Tanács, 1982, Tanács, 1992, Tanács *et al.*, 1985, 1993, 1999, 2009). According to population dynamics examinations Benedek (1968) and Móczár *et al.* (1972) found that in general *Halictus* and *Lasioglossum* species have two generations. They are called two-generation, bivoltine species, with long flying period, while certain *Hylaeus* and *Bombus* species are continuously breeding, with long flying period.

In addition to these sources, the taxonomic works of Móczár (1957, 1958, 1960, 1967) were used concerning Colletinae, Melittinae, Megachilinae, Halictinae, Anthophorinae, and Apinae. These works contain references for the evaluation of the geographical distribution, ecological, climatic endurance, flight times and prevalence aspects of the species. The works of Pittioni *et al.* (1942) and Móczár (1948) refer to the ecological distribution and climatic endurance classification.

MATERIALS AND METHODS:

Higher level taxonomy and nomenclature of Apidae follow Józán (2011). All specimens reported here are deposited in the HNHM Hymenoptera Collection.

Collecting data follow A. Gubányi's paper about collecting sites published in this volume. Collectors' names are abbreviated in the list as: AGr – Aranka Grabant, AGu – András Gubányi, AK – Attila Kenéz, AO – András Orosz, AP – Attila Podlussány, CsK – Csaba Kutasi, DM – Dávid Murányi, GK – Gergely P. Katona, GP – Gellért Puskás, LD – László Dányi, LF – László Forró, LR – László Ronkay, MT – Mária Tóth, OM – Ottó Merkl, PS – Péter G. Sulyán, VSz – Viktória Szőke, ZE – Zoltán P. Eröss, ZS – Zoltán Soltész, ZV – Zoltán Vas, ZsB – Zsolt Bálint.

The ecological evaluation of the collected Apidae material is also given. The evaluation covered geographical distribution, ecological, climatic endurance, flight times and prevalence aspects. The categories of the species according to geographical distribution is marked with an asterisk *, flight time with two asterisks **, ecological, climatic endurance with three asterisks***, while prevalence with four asterisks****.

RESULTS AND DISCUSSION:

Colletinae

Colletes daviesanus Smith, 1846

1 ♂: 228: Munții Meseșului (Meszes-hegység), Treznea (Ördögkút), alongside creek, wet meadow,

14.07.2015, N47.1091° E23.0728°; hand collecting, ZE, AK, PS & ZV. – 10 ♂♂: 234: Dealurile Crasnei (Krasznamenti-dombság), Aghireş (Egrespatak), dry sward with loess wall and orchard, 15.07.2015, N47.1571° E22.9937°; hand collecting, sweeping, PS & ZV. – Remark: * Palearctic, ** continuously breeding, with long flying period, *** hypereuryoecious intermediary, **** frequent species.

Hylaesus annulatus (Linnaeus, 1758)

1 ♀: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârşolţ (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; sweeping, hand collecting, pitfall traps, AO, GP, ZS & MT. – Remark: * West Palearctic, ** medium flight period, *** euryoecious-hylophilous, **** sporadic species.

Hylaesus brevicornis Nylander, 1852

1 ♀: 236: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), near Vârşolţ (Varsolc) reservoir, willows and wet meadow, 15.07.2015, N47.1776° E22.8891°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Palearctic, ** continuously breeding, with long flying period, *** hypereuryoecious- intermediary, **** frequent species.

Hylaesus communis Nylander, 1852

1 ♂: 162: Dealurile Sălajului (Szilágymenti-dombság), Borla (Szilágyballa), abandoned arable land, 10.05.2015, N47.265° E22.938°; sweeping, AGr, OM, AP & VSz. – 1 ♀, 3 ♂♂: 250: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), Mlaştina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Palearctic, ** continuously breeding, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Hylaesus hyalinatus Smith, 1842

1 ♀: 250: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), Mlaştina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Palearctic, ** medium flight period, *** hypereuryoecious-intermediary **** sporadic species.

Hylaesus rinki (Gorski, 1852)

1 ♀: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârşolţ (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; sweeping, hand collecting, pitfall traps, AO, GP, ZS & MT. – Remark: * Palearctic, ** medium flight period, *** euryoecious-hylophilous, **** sporadic species.

Hylaesus variegatus (Fabricius, 1798)

1 ♀: 250: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), Mlaştina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Holo-Mediterranean, ** medium flight period, *** euryoecious eremophilous, **** frequent species.

Andreninae

Andrena congruens Schmiedeknecht, 1883

1 ♀: 34: Dealurile Crasnei (Krasznamenti-dombság), Vârşolţ (Varsolc), near Vârşolţ Reservoir, willows, reed bed, 20.05.2014, N47.17847° E22.88972°; pitfall traps, ZsB, AGu, GK & CsK. – 1 ♂: 165: Culoarul Someşului (Szamos völgye), Surduc (Szurduk), pasture, 11.05.2015, N47.291° E23.374°; sweeping, beating, AGr, OM, AP & VSz. – 1 ♀: 167: Culoarul Someşului (Szamos völgye), Surduc (Szurduk), pasture, 11.05.2015, N47.291° E23.374°; hand collecting, AGr, OM, AP & VSz. – 1 ♀: 200: Munţii Plopiş (Réz-hegység), Tusa (Tuszatelke), Barcău (Berettyó) springs, 13.05.2015, N47.02° E22.749°; hand collecting, AGr, OM, AP & VSz. – 1 ♀: 236: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), near Vârşolţ (Varsolc) reservoir, willows and wet meadow, 15.07.2015, N47.1776° E22.8891°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * -, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** very rare species.

Andrena cordialis Morawitz, 1877

1 ♂: 60A: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireş (Egrespatak), dry swards, 02-03.06.2014, N47.157° E22.992°; sweeping, hand collecting, pitfall traps, light trap, AO, GP, ZS & MT. – Remark: * Pontic, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** sporadic species.

Andrena curvungula (Thompson, 1870)

1 ♂: 201: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), Mlaştina de la Iaz, pasture, 13.05.2015, N47.11° E22.659°; sweeping, hand collecting, AGr, OM, AP & VSz. – Remark: * Euro-Siberian, ** medium flight period, *** hypereuryoecious-intermediary, **** sporadic species.

Andrena flavipes Panzer, 1799

1 ♂: 234: Dealurile Crasnei (Krasznamenti-dombság), Aghireş (Egrespatak), dry sward with loess wall and orchard, 15.07.2015, N47.1571° E22.9937°; hand collecting, sweeping, PS & ZV. – Remark: * Palearctic, ** bivoltine, with long flying period, *** euryoecious-eremophileus, **** frequent species.

Andrena nana (Kirby, 1802)

1 ♀: 66: Munţii Meseşului (Meszes-hegység), 1 km E of Huta (Csákyújfalú), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: *-, **-, ***-, ****-.

Andrena ovatula (Kirby, 1802)

1 ♀: 60A: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireş (Egrespatak), dry swards, 02-03.06.2014, N47.157° E22.992°; sweeping, hand collecting, pitfall traps, light trap, AO, GP, ZS & MT. – Remark: * Atlantic, ** bivoltine, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Andrena rosae Panzer, 1801

2 ♀♀: 167: Culoarul Someșului (Szamos völgye), Surduc (Szurduk), pasture, 11.05.2015, N47.291° E23.374°; hand collecting, AGr, OM, AP & VSz. – Remark: * Euro-Siberian, ** bivoltine, with long flying period, *** hypereuryoecious intermediary, **** sporadic species.

Andrena subopaca Nylander, 1848

1 ♀: 36: Munții Meseșului (Meszes-hegység), Huta (Csákyújfalu), clearing, alder groove at stream, wet meadow, 21-23.05.2014, N46.99677° E22.93072°; pitfall traps baited with vinegar, ZsB, AGu, GK & CsK. – 1 ♂: 66: Munții Meseșului (Meszes-hegység), 1 km E of Huta (Csákyújfalu), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 68A: Munții Meseșului (Meszes-hegység), Pria (Perje), SW slope of Vf. Măgura Prici (Perjei csúcs), 04.06.2014, N47.007° E22.9°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 73: Dealurile Crasnei (Krasznamenti-dombság), Șimleu Silvaniei (Szilágysomlyó), 05.06.2014, N47.237° E22.804°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 228: Munții Meseșului (Meszes-hegység), Treznea (Ördögkút), alongside creek, wet meadow, 14.07.2015, N47.1091° E23.0728°; hand collecting, ZE, AK, PS & ZV. – Remark: * European, ** bivoltine, with long flying period, *** hypereuryoecious-intermediary, frequent species.

Halictinae

Halictus simplex Blüthgen, 1923

1 ♀: 228: Munții Meseșului (Meszes-hegység), Treznea (Ördögkút), alongside creek, wet meadow, 14.07.2015, N47.1091° E23.0728°; hand collecting, ZE, AK, PS & ZV. – Remark: * Holo-Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** frequent species.

Lasioglossum discum (Smith, 1853)

1 ♀: 85: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireș (Egrespatak), dry swards, 04.06-13.08.2014, N47.157° E22.992°; pitfall traps, AGu, GK, AO & GP. – Remark: * North-Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** frequent species.

Lasioglossum glabriusculum (Morawitz, 1872)

12 ♀♀: 66: Munții Meseșului (Meszes-hegység), 1 km E of Huta (Csákyújfalu), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – 2 ♀♀: 234: Dealurile Crasnei (Krasznamenti-dombság), Aghireș (Egrespatak), dry sward with loess wall and orchard, 15.07.2015, N47.1571° E22.9937°; hand collecting, sweeping, PS & ZV. – Remark: * North Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophileus, **** sporadic species.

Lasioglossum leucozonium (Schrank, 1781)

1 ♀: 60A: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireș (Egrespatak), dry swards, 02-03.06.2014, N47.157° E22.992°; sweeping, hand

collecting, pitfall traps, light trap, AO, GP, ZS & MT. – 1 ♀: 69: Munții Meseșului (Meszes-hegység), 2.5 km SW of Huta (Csákyújfalu), at Poicu Stream, 04.06.2014, N46.986° E22.917°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * Holo-Mediterranean, ** bivoltine, with long flying period, *** hypereuryoecious intermediary, **** frequent species.

Lasioglossum malachurum (Kirby, 1802)

1 ♀: 17: Munții Plopiș (Réz-hegység), Tusa (Tuszatelke), Barcău (Berettyó) springs, 24.04.2014, N47.02001° E22.75373°; hand collecting, AGu, GK & CsK. – 1 ♀: 62A: Munții Plopiș (Réz-hegység), Tusa (Tuszatelke), above the village, at Barcău (Berettyó) springs, 03.06.2014, N47.02° E22.749°; sweeping, hand collecting, AO, GP, ZS & MT. – 2 ♀♀: 66: Munții Meseșului (Meszes-hegység), 1 km E of Huta (Csákyújfalu), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – 2 ♀♀: 73: Dealurile Crasnei (Krasznamenti-dombság), Șimleu Silvaniei (Szilágysomlyó), 05.06.2014, N47.237° E22.804°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 167: Culoarul Someșului (Szamos völgye), Surduc (Szurduk), pasture, 11.05.2015, N47.291° E23.374°; hand collecting, AGr, OM, AP & VSz. – 1 ♀: 171: Culoarul Someșului (Szamos völgye), Cliț (Csúrfalva), hornbeam-oak forest, 11.05.2015, N47.284° E23.439°; sweeping, AGr, OM, AP & VSz. – 2 ♀♀: 184: Munții Meseșului (Meszes-hegység), Poic, wet meadow, 12.05.2015, N46.98° E22.925°; sweeping, AGr, OM, AP & VSz. – 2 ♀♀: 228: Munții Meseșului (Meszes-hegység), Treznea (Ördögkút), alongside creek, wet meadow, 14.07.2015, N47.1091° E23.0728°; hand collecting, ZE, AK, PS & ZV. – 5 ♀♀, 21 ♂♂: 234: Dealurile Crasnei (Krasznamenti-dombság), Aghireș (Egrespatak), dry sward with loess wall and orchard, 15.07.2015, N47.1571° E22.9937°; hand collecting, sweeping, PS & ZV. – 1 ♀: 236: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), near Vârșoț (Varsolc) reservoir, willows and wet meadow, 15.07.2015, N47.1776° E22.8891°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * North Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** frequent species.

Lasioglossum marginatum (Brullé, 1832)

2 ♀♀: 32: Dealurile Crasnei (Krasznamenti-dombság), Aghireș (Egrespatak), dry swards, 20.05.2014, N47.15716° E22.99252°; pitfall traps, ZsB, AGu, GK & CsK. – Remark: * Holo-Mediterranean, ** medium flight period, *** euryoecious-eremophilous, **** sporadic species.

Lasioglossum morio (Fabricius, 1793), 3 female, No. 64.

3 ♀♀: 64: Dealurile Crasnei (Krasznamenti-dombság), between Valcău de Jos (Alsóvalkó) and Boghiș (Szilagybagos), at Barcău (Berettyó) River, 03.06.2014, N47.139° E22.739°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * North

Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** frequent species.

Lasioglossum pallens (Brullé, 1832)

1 ♂: 167: Culoarul Someşului (Szamos völgye), Surduc (Szurduk), pasture, 11.05.2015, N47.291° E23.374°; hand collecting, AGr, OM, AP & VSz. – Remark: * Holo-Mediterranean, ** short flight period, *** euryoecious eremophilous, **** rare species.

Lasioglossum pauxillum (Schenck, 1853)

1 ♀, 1 ♂: 234: Dealurile Crasnei (Krasznamenti-dombság), Aghireş (Egrespatak), dry sward with loess wall and orchard, 15.07.2015, N47.1571° E22.9937°; hand collecting, sweeping, PS & ZV. – Remark: * Ponto-Caspian-Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** frequent species.

Lasioglossum politum (Schenck, 1853)

2 ♀♀: 66: Munţii Meseşului (Meszes-hegység), 1 km E of Huta (Csákyújfalú), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♂: 250: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), Mlaştina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Ponto-Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** frequent species.

Lasioglossum quadrisignatum (Schenck, 1853)

1 ♀: 61A: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), 03.06.2014, N47.111° E22.659°; sweeping, hand collecting, AO, GP, ZS & MT. – 3 ♀♀: 66: Munţii Meseşului (Meszes-hegység), 1 km E of Huta (Csákyújfalú), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * Holo-Mediterranean, ** medium flight period, *** euryoecious-eremophilous, **** very rare.

Lasioglossum villosulum (Kirby, 1802)

1 ♀: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârşoţ (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; sweeping, hand collecting, pitfall traps, AO, GP, ZS & MT. – 1 ♀: 61A: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), 03.06.2014, N47.111° E22.659°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 73: Dealurile Crasnei (Krasznamenti-dombság), Şimleu Silvaniei (Szilágysomlyó), 05.06.2014, N47.237° E22.804°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 171: Culoarul Someşului (Szamos völgye), Cliţ (Csúrfalva), hornbeam-oak forest, 11.05.2015, N47.284° E23.439°; sweeping, AGr, OM, AP & VSz. – Remark: * Peleartic, ** bivoltine, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Lasioglossum zonulum (Smith, 1848)

1 ♀: 66: Munţii Meseşului (Meszes-hegység), 1 km E of Huta (Csákyújfalú), 04.06.2014, N47.015°

E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 69: Munţii Meseşului (Meszes-hegység), 2.5 km SW of Huta (Csákyújfalú), at Poicu Stream, 04.06.2014, N46.986° E22.917°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * Holo-Mediterranean, ** bivoltine, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Rhophotoides canus (Eversmann, 1832)

1 ♂: 34: Dealurile Crasnei (Krasznamenti-dombság), Vârşoţ (Varsolc), near Vârşoţ Reservoir, willows, reed bed, 20.05.2014, N47.17847° E22.88972°; pitfall traps, ZsB, AGu, GK & CsK. – Remark: * European, ** short flight period, *** euryoecious-hylophilous, **** sporadic species.

Sphecodes longulus Hagens, 1882

1 ♂: 250: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), Mlaştina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * European, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** sporadic species.

Sphecodes monilicornis (Kirby, 1802)

1 ♂: 250: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), Mlaştina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Palearctic, ** bivoltine, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Melittinae

Macropis fulvipes (Fabricius, 1804)

2 ♂♂: 61A: Munţii Plopiş (Réz-hegység), Iaz (Krasznajáz), 03.06.2014, N47.111° E22.659°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * Central European, ** short flight period, *** euryoecious hylophilous, **** sporadic species.

Megachilinae

Chelostoma campanularum (Kirby, 1802)

1 ♂: 67B: Munţii Meseşului (Meszes-hegység), 1.5 km SW of Huta (Csákyújfalú), 04.06.2014, N46.994° E22.929°; sweeping, pitfall traps, AO, GP, ZS & MT. – 1 ♂: 226: Munţii Meseşului (Meszes-hegység), beech forest, 14.07.2015, N47.1383° E23.0847°; hand collecting, ZE, AK, PS & ZV. – Remark: * European, ** short flight period, *** hypereuryoecious-intermediary, ****rare species.

Chelostoma foveolatum (Morawitz, 1868)

1 ♂: 66: Munţii Meseşului (Meszes-hegység), 1 km E of Huta (Csákyújfalú), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * Holo-Mediterranean, ** Short flight period, *** euryoecious-eremophilous, **** rare species.

Chelostoma grandis (Nylander, 1852)

1 ♀, 2 ♂♂: 211: Depresiunea Almaş-Agrij (Almás-Egregy-medence), Ugruţi (Ugróc), 27-28.05.2015,

N47.025783° E23.350829°; light trap, ZsB, AGu & GK. – Remark: * North Mediterranean ** Short flight period, *** euryoecious-eremophilous, **** very rare.

Heriades crenulatus Nylander, 1856

1 ♂: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârșolț (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; sweeping, hand collecting, pitfall traps, AO, GP, ZS & MT. – 1 ♀, 1 ♂: 250: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Holo-Mediterranean, ** short flight period, *** euryoecious hylophilous, **** frequent species.

Osmia leucomelaena (Kirby, 1802)

1 ♂: 66: Munții Meseșului (Meszes-hegység), 1 km E of Huta (Csákyújfalú), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * North and Central European, ** short flight period, *** euryoecious-eremophilous, **** rare species.

Osmia rufa (Linnaeus, 1758)

1 ♀: 194: Dealurile Crasnei (Krasznamenti-dombság), Aghireș (Egrespatak), loess wall, 13.05.2015, N47.157° E22.994°; hand collecting, AGr, OM, AP & VSz. – Remark: * Palearctic, ** short flight period, *** euryoecious-hylophilous, **** frequent species.

Anthophorinae

Anthophora crinipes Smith, 1654

1 ♂: 171: Culoarul Someșului (Szamos völgye), Cliț (Csúrfalva), hornbeam-oak forest, 11.05.2015, N47.284° E23.439°; sweeping, AGr, OM, AP & VSz. – Remark: * North Mediterranean, ** medium flight period, *** hypereuryoecious-intermediary, **** frequent species.

Eucera pollinosa Smith, 1854

1 ♀, 1 ♂: 60A: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireș (Egrespatak), dry swards, 22.05-03.06.2014, N47.157° E22.992°; pitfall traps, sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 85: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireș (Egrespatak), dry swards, 04.06-13.08.2014, N47.157° E22.992°; pitfall traps, AGu, GK, AO & GP. – Remark: * North Mediterranean, ** medium flight period, *** stenoecious-eremophilous, **** sporadic species.

Eucera tuberculata (Fabricius, 1793)

1 ♀: 60A: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireș (Egrespatak), dry swards, 22.05-03.06.2014, N47.157° E22.992°; pitfall traps, sweeping, hand collecting, AO, GP, ZS & MT. – 6 ♂♂: 167: Culoarul Someșului (Szamos völgye), Surduc (Szurduk), pasture, 11.05.2015, N47.291° E23.374°; hand collecting, AGr, OM, AP & VSz. – Remark: * North Mediterranean ** medium flight

period, *** euryoecious-eremophilous, **** frequent species.

Melecta albifrons (Förster, 1771)

1 ♂: 171: Culoarul Someșului (Szamos völgye), Cliț (Csúrfalva), hornbeam-oak forest, 11.05.2015, N47.284° E23.439°; sweeping, AGr, OM, AP & VSz. – Remark: * European, ** medium flight period, *** hypereuryoecious-intermediary, **** rare species.

Nomada fucata Panzer, 1798

1 ♂: 61A: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), 03.06.2014, N47.111° E22.659°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♂: 184: Munții Meseșului (Meszes-hegység), Poic, wet meadow, 12.05.2015, N46.98° E22.925°; sweeping, AGr, OM, AP & VSz. – Remark: * West Palearctic, ** bivoltine, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Nomada platythorax Schwarz, 1981

1 ♂: 66: Munții Meseșului (Meszes-hegység), 1 km E of Huta (Csákyújfalú), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – Remark: * Ponto-Mediterranean, ** short flight period, *** euryoecious-eremophilous, **** rare species.

Nomada rhenana Morawitz, 1872

1 ♂: 184: Munții Meseșului (Meszes-hegység), Poic, wet meadow, 12.05.2015, N46.98° E22.925°; sweeping, AGr, OM, AP & VSz. – Remark: * North Mediterranean, ** bivoltine, with long flying period, *** euryoecious-eremophilous, **** frequent species.

Nomada sexfasciata Panzer, 1799

1 ♂: 167: Culoarul Someșului (Szamos völgye), Surduc (Szurduk), pasture, 11.05.2015, N47.291° E23.374°; hand collecting, AGr, OM, AP & VSz. – Remark: * North Mediterranean, ** medium flight period, *** euryoecious-eremophilous, **** sporadic species.

Apinae

Bombus argillaceus (Scopoli, 1763)

1 ♀: 195: Dealurile Crasnei (Krasznamenti-dombság), Aghireș (Egrespatak), dry sward, 13.05.2015, N47.157° E22.994°; sweeping, beating, AGr, OM, A P & VSz. – Remark: * Holo-Mediterranean, ** continuously breeding, with long flying period, *** euryoecious-eremophilous **** rare species.

Bombus hortorum (Linnaeus, 1761)

1 ♀, 1 ♂: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârșolț (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; sweeping, hand collecting, pitfall traps, AO, GP, ZS & MT. – 1 ♂: 228: Munții Meseșului (Meszes-hegység), Treznea (Ördögkút), alongside creek, wet meadow, 14.07.2015, N47.1091° E23.0728°; hand collecting, ZE, AK, PS & ZV. – Remark: * Palearctic, ** continuously breeding,

with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Bombus humilis Illiger, 1806

1 ♀: 227: Munții Meseșului (Meszes-hegység), rocky roadside with ruderal vegetation, 14.07.2015, N47.1217° E23.0966°; hand collecting, ZE, AK, PS & ZV. – Remark: * European, ** continuously breeding, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Bombus lucorum (Linnaeus, 1761)

1 ♀: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârșolț (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; sweeping, hand collecting, pitfall traps, AO, GP, ZS & MT. – Remark: * Palearctic, ** continuously breeding, with long flying period, *** euryoecious-hylophilous, **** frequent species.

Bombus pascuorum (Scopoli, 1763)

1 ♀: 170: Culoarul Someșului (Szamos völgye), Cliț (Csúrfalva), hornbeam-oak forest, 11.05.2015, N47.284° E23.439°; hand collecting, AGr, OM, AP & VSz. – 2 ♀♀: 224: Munții Meseșului (Meszes-hegység), pass near Zalău (Zilah), at a spring and a car park on road 81E, 14.07.2015, N47.154° E23.0895°; hand collecting, ZE, AK, PS & ZV. – 1 ♀: 250: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz, mixed vegetation, 16.07.2015, N47.1108° E22.6602°; hand collecting, sweeping, flight intercept trap, PS & ZV. – Remark: * Palearctic, ** continuously breeding, with long flying period, *** euryoecious-hylophilous, **** frequent species.

Bombus ruderarius (Müller, 1776)

1 ♀: 30: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz 3, oak forest, orchard-oak ecotone, pastures, 20.05.2014, N47.11075° E22.66208°; pitfall traps, ZsB, AGu, GK & CsK. – 1 ♀: 60A: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireș (Egrespatak), dry swards, 22.05-03.06.2014, N47.157° E22.992°; pitfall traps, AO, GP, ZS & MT. – Remark: * North- and Central European, ** continuously breeding, with long flying period, *** euryoecious-hylophilous, **** frequent species.

Bombus sylvarum (Linnaeus, 1761)

2 ♀♀: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârșolț (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; pitfall traps, AO, GP, ZS & MT. – 1 ♂: 231: Munții Meseșului (Meszes-hegység), Huta (Csákyújfalu), creek valley, beech forest, 14.07.2015, N46.9936° E22.9285°; hand collecting, ZE, AK, PS & ZV. – Remark: * Central European, ** continuously breeding, with long flying period, *** hypereuryoecious-intermediary, **** frequent species.

Bombus terrestris (Linnaeus, 1758)

2 ♀♀: 30: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz 3, oak forest, orchard-oak ecotone, pastures, 20.05.2014, N47.11075°

E22.66208°; pitfall traps, ZsB, AGu, GK & CsK. – 1 ♀: 34: Dealurile Crasnei (Krasznamenti-dombság), Vârșolț (Varsolc), near Vârșolț Reservoir, willows, reed bed, 20.05.2014, N47.17847° E22.88972°; pitfall traps, ZsB, AGu, GK & CsK. – 1 ♂: 163: Dealurile Crasnei (Krasznamenti-dombság), Zalău (Zilah), churchyard, 11.05.2015, N47.18° E23.056°; from beneath stones, AGr, OM, AP & VSz. – 2 ♂♂: 224: Munții Meseșului (Meszes-hegység), pass near Zalău (Zilah), at a spring and a car park on road 81E, 14.07.2015, N47.154° E23.0895°; hand collecting, ZE, AK, PS & ZV. – Remark: * Palearctic, ** continuously breeding, with long flying period, *** euryoecious-hylophilous, **** sporadic species.

Apis mellifera Linnaeus, 1758

1 ♀: 36: Munții Meseșului (Meszes-hegység), Huta (Csákyújfalu), clearing, alder groove at stream, wet meadow, 21-23.05.2014, N46.99677° E22.93072°; pitfall traps baited with vinegar, ZsB, AGu, GK & CsK. – 3 ♀♀: 57: Dealurile Crasnei (Krasznamenti-dombság), Crasna (Kraszna), Vârșolț (Varsolc) Reservoir, 02.06.2014, N47.177° E22.889°; pitfall traps, AO, GP, ZS & MT. – 1 ♀: 60A: Dealurile Crasnei (Krasznamenti-dombság), W of Aghireș (Egrespatak), dry swards, 02-03.06.2014, N47.157° E22.992°; sweeping, hand collecting, pitfall traps, light trap, AO, GP, ZS & MT. – 5 ♀♀: 61A: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), 03.06.2014, N47.111° E22.659°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 61B: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), 03.06.2014, N47.111° E22.657°; sweeping, hand collecting, AO, GP, ZS & MT. – 2 ♀♀: 66: Munții Meseșului (Meszes-hegység), 1 km E of Huta (Csákyújfalu), 04.06.2014, N47.015° E22.963°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 73: Dealurile Crasnei (Krasznamenti-dombság), Șimleu Silvaniei (Szilágysomlyó), 05.06.2014, N47.237° E22.804°; sweeping, hand collecting, AO, GP, ZS & MT. – 1 ♀: 201: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz, pasture, 13.05.2015, N47.11° E22.659°; sweeping, hand collecting, AGr, OM, AP & VSz. – 1 ♀: 227: Munții Meseșului (Meszes-hegység), rocky roadside with ruderal vegetation, 14.07.2015, N47.1217° E23.0966°; hand collecting, ZE, AK, PS & ZV. – 1 ♀: 232: Munții Meseșului (Meszes-hegység), Poic, marshy meadow, 14.07.2015, N46.9842° E22.9199°; hand collecting, sweeping, ZE, AK, PS & ZV. – 1 ♀: 234: Dealurile Crasnei (Krasznamenti-dombság), Aghireș (Egrespatak), dry sward with loess wall and orchard, 15.07.2015, N47.1571° E22.9937°; hand collecting, sweeping, PS & ZV. – Remark: * -, **-, ***-, ****-.

The synbiological evaluation of the Apidae material gathered in Szilágyság (Salaj, Romania)

a) Zoogeographical division

Considering zoogeographical evaluation it is obvious that the widespread Palaearctic species (13 species, 23.63 %), as well as the total of the

Mediterranean elements (Holo-Mediterranean 10 species, 18.18 %; North Mediterranean 10 species, 18.18 %; Ponto-Mediterranean 2 species, 3.64 %) are the most significant community forming species (Table 1).

Table 1.
Zoogeographical distribution.

Zoogeographical character	Number of species	%
Palaeartic	13	23.63
West Palaeartic	2	3.64
Euro-Siberian	2	3.64
European	6	10.91
Holo-Mediterranean	10	18.18
Ponto-Mediterranean	2	3.64
North Mediterranean	10	18.18
Ponto-Caspian-Mediterranean	1	1.82
Atlantic	1	1.82
Central European	2	3.64
North and Central European	2	3.64
Pontic	1	1.82
Unranked	3	5.44
Total	55	100.00

b) Division based on flying dynamics

When evaluating flying dynamics, the bivoltine species with long flying period seemed to be the main contributors of the community. This group involves *Andrena*, *Halictus* and *Lasioglossum* species (Table 2).

Tab. 2.
Flying dynamics.

Phenological character	Number of species	%
Short flight period	10	18.18
Medium flight period	12	21.82
Bivoltine, with long flying period	20	36.36
Continuously breeding, with long flying	11	20.00
Unranked	2	3.64
Total	55	100.00

c) Distribution based on ecofaunistic (climate endurance) characteristics

Evaluating the ecological and climate endurance characteristics, the group of the euryoecious eremophilous species was the most significant (Table 3) with 23 species, 41.81 %. It can be explained by the fact that the area is in the vicinity of the Mediterranean region and there are a lot of Apinae elements within the bee community.

Tab. 3.
Ecofaunistic characteristics.

Ecofaunistic characteristics	Number of species	%
Stenoecious-eremophilous	1	1.82
Euryoecious-eremophilous	23	41.81
Hypereuryoecious-intermediary	16	29.09
Euryoecious-hylophileus	13	23.64
Unranked	2	3.64
Total	55	100.00

d) Distribution regarding frequency

The majority of the collected species are frequent and common (29 species, 52.73 %); however, some rare species were also found (Table 4). Rare species in the region and, in the same time in the fauna of the Carpathian Basin are *Andrena congruens* Schmedeknecht, 1883, *Lasioglossum quadrisignatum* (Schenk), and *Chelostoma grandis* (Nylander). Rare species in Sălaj County are *Lasioglossum pallens* (Brullé), *Chelostoma campanularum* (Kirby), *Chelostoma foveolatum* (Morawitz), *Osmia leucomelaena* (Kirby), *Melecta albifrons* (Förster), *Nomada platythorax* Schwarz, and *Bombus argillaceus* (Scopoli).

Tab. 4.
Categorisation by frequency.

Frequency categories	Number of species	%
Frequent	29	52.73
Sporadic	14	25.45
Rare	7	12.73
Very rare	3	5.45
Unranked	2	3.64
Total	55	100.00

CONCLUSIONS:

In total, during the sampling period 168 Apidae specimens were collected, belonging to 55 species. The number of bee specimens and that of the species is too low to form a grounded opinion to evaluate the fauna of Sălaj County. These data are rather indicative and suitable for more cautious statements.

ACKNOWLEDGEMENTS

I thank Dr. Zoltán Vas (curator of the Hymenoptera Collection of the Hungarian Natural History Museum) for his help in compiling the taxon list.

REFERENCES:

- Benedek P, The flight period of wild bees (Hymenoptera, Apidae) pollinating Lucerne, and its plant protection aspects. *Acta Phytopathologica Hungarica*, 3, 59–71, 1968.
- Dathe H, Die Arten der Gattung *Hylaeus* F. in Europa (Hymenoptera: Apidae, Colletidae). *Mitt. zool. Mus. Berl.*, 56(2), 207–294, 1980.
- Dylewska M, Die Gattung *Andrena* Fabricius (Andrenidae, Apidae) in Nord- und Mitteleuropa. *Acta zoologica cracoviensia*, 361–708, 1987.
- Gubányi A, Collecting sites of the Hungarian Natural History Museum in Sălaj, Romania, between 2014 and 2015. *Studia Universitatis Vasile Goldis Seria Stiintele Vietii (Life Sciences Series)*, 25(3), 157–167, 2015.
- Eardley C, Pollinator biodiversity a co-ordinated global approach. *Acta Horticulturae*, 561, 331–332, 2001.
- Ebmer AW, Die Bienen des Genus *Halictus* Latr., s. I. im Grossraum von Linz (Hymenoptera, Apidae) Teil I-III. *Naturkundl. Jb. Stadt Linz.* 1969, 133–189, 1970, 19–82, 1971, 63–156, 1969–1971.
- Józán Zs. Checklist of Hungarian Sphecidae and Apidae species (Hymenoptera, Sphecidae and Apidae). *Natura Somogyiensis*, 19, 177–200, 2011.
- Kocourek M, Prodrómus der Hymenoptera der Tschechoslowakei. *Acta faun. ent. natn. Prage*, 12. Suppl. 2, 1–122, 1966.
- Móczár L, Die Seehöhe und ökologischen Gesichtspunkte in der Bezeichnung zoogeographischer Gebietsheiten. *Fragmenta Faunistica Hungarica*, 11, 85–89, 1948.
- Móczár L, Schwarz M, A Nomada-, Ammobates-, Pasites és Paramobates nemek faunakatalógusa (Cat. Hym., XXIII.). *Folia entomologica hungarica*, 21, 339–360, 1968.
- Móczár L, Warncke K, Faunenatalog der Gattung *Andrena* Fabricius (Cat. Hym., XXVI.). *Acta Biologica Szeged*, 18, 185–221, 1972.
- Móczár M, Apidae – Méhfélék. In: Magyarország Állatvilága (Fauna Hungariae), XIII/13., 1–76, 1957.
- Móczár M, Megachilidae – Művészméhek. In: Magyarország Állatvilága (Fauna Hungariae), XIII. 12, 1–78, 1958.
- Móczár M, Colletidae (Ösméhek) – Melittidae (Földiméhek). In: Magyarország Állatvilága (Fauna Hungariae) XIII/9, 1–64, 1960.
- Móczár M, Halictidae – Karcsúméhek. In: Magyarország Állatvilága (Fauna Hungariae) XIII/11, 1–116, 1967.
- Pittioni B, Schmidt H, Die Bienen der südöstlichen Niederdonau. *Niederdonau Natur und Kultur* H, 19, 1–69, 24, 1–89, 1942.
- Osychniuk AZ, Fauna Ukrajna. Kiev, Naukova Dumka, 1–326, 1977.
- Osychniuk AZ, Panfilov DV, Ponomarjeva AA, Apidae. In: Opregyelityej naszekomüh europeijszkij csastryi CCCP, III. Perepancstokrülje, Red. Medvegyeva, Sz. Leningrad, Nauka, 279–519, 1978.
- Raw A, The risk of pollinator decline and the global pollinators initiative. *Acta Horticulture*, 561, 327–330, 2001.
- Scheuchl E, Band I. Anphoridae, Illustrierte Bestimmungstabellen der Wildbienen Deutschland und Österreichs, 1–158. Presinger KG, Landshut, 1995. ISBN 3-00-000430-0
- Scheuchl E, Megachilidae – Melittidae, Illustrierte Bestimmungstabellen der Wildbienen Deutschlands und Österreichs, 1–116, Presinger KG, Landshut, 1996. ISBN 3-00-000430-0
- Tanács L, Untersuchung der blumenbesuchenden bienenförmigen Insektenpopulation (Hymenoptera: Apidae) auf dem Rasen-Ökosystem der Bugacer Sandheide. *Folia entomologica hungarica*, 43(1), 179–190, 1982.
- Tanács L, A vadméh fajok ökofaunisztikai vizsgálat a Tisza folyó mentén (Hymenoptera, Apidae). *Folia entomologica hungarica*, 53, 231–249, 1992.
- Tanács L, Józán Zs, The Apoid fauna of the Kiskunság National Park. In: Mahunka, S. (Ed.) The fauna of the Kiskunság National Park. Akadémiai Kiadó, Budapest, 401–425, 1985.
- Tanács L, Józán Zs, The Apoid fauna of the Bükk National Park. In: Mahunka, S. (Ed.): The Fauna of the Bükk National Park, 1. Hungarian Natural History Museum, Budapest, 423–444, 1993.
- Tanács L, Józán Zs, The Apoid fauna of the Aggtelek National Park (Hymenoptera). In: Mahunka, S. (Ed.). The Fauna of the Aggtelek National Park. Hungarian Natural History Museum, Budapest, 591–608, 1999.
- Tanács L, Benedek P, Móczár L, Changes in Lucerne pollinating wild bee assemblages in Hungary from the pre-pesticide era to 2007. *Beiträge zur Entomologie* 59(2), 335–353, 2009.