

Lacewing Diversity and Abundance in Eskişehir Province, Northwest Turkey

Savaş CANBULAT¹, Ayhan GÜLER², Tariq A. M. TYEB³

1. Department of Environmental Engineering, Faculty of Engineering and Architecture, Kastamonu University, Kastamonu, Turkey.

2. Department of Biomedical Engineering, Faculty of Engineering and Architecture, Hakkari University, Hakkari, Turkey.

3. Faculty of Science Education for Elementary Schools, Kastamonu University, 37100, Kastamonu, Turkey.

Received: October 11, 2017 / Accepted: November 12, 2017 / Published: December 25, 2017

Abstract: In this study, between August-October in 2010 and between April-June in 2011, a total number of 791 lacewing specimens (51% females and 49% males) were collected from 68 randomly located sampling 13 county and villages of Eskişehir province in Northwest Turkey. Samples were collected using three methods: beating the vegetation with a hand-net, using a Japanese umbrella, and light-trapping specimens at night. As a result of the identifications 37 species of 21 genera belonging to the 7 families of the order Neuroptera were determined. Ecologies and distributions of 37 species determined from the research area were given. In 37 species, 34 species are new records for the Eskişehir province fauna. The most abundant and most frequent species were *Chrysoperla carnea* and *Myrmecaelurus trigrammus*. Species living in the Eskişehir province were frequent as well: *Chrysopa dorsalis*, *Hemerobius handschini* and *Palpares libelluloides*. According to the phenological data of 37 species, *Coniopteryx (Coniopteryx) pygmaea*, *Hemerobius lutescens* and *Hemerobius zernyi* in May, *Distoleon tetragrammicus*, *Hemerobius stigma* and *Wesmaelius (Kimminsia) ravus* in June, *Italochrysa italic*, *Nineta principiae*, *Neuroleon assimilis*, *Lertha schmidti* and *Nemoptera sinuate* in July, *Wesmaelius (Kimminsia) subnebulosus* and *Aleuropteryx loewii* in August, *Symphorobius (Nireberge) fuscescens* have been found in September. However, *Dichochrysa flavifrons* and *Dichochrysa zelleri* have been determined seasonal flight activity from May to September. Abundance, dominance and frequency for each species are added.

Key words: Neuroptera, Turkey, Composition, seasonal flight activity; dominance, frequency

1. Introduction

The order Neuroptera is one of the smallest and primitive among the holometabolic insects. The adults and larvae from most families are predators, which make them very interesting to many entomologists, since some can have a considerable value as predators to be used in biological control programs [1].

Corresponding author: Savaş CANBULAT, Department of Environmental Engineering, Faculty of Engineering and Architecture, Kastamonu University, Kastamonu, Turkey.

The order Neuroptera includes 687 species and 17 subspecies in the Palaearctic region and about 6000 species in the world [2].

Aspöck et al. [2, 3] revisioned the faunistical records and compiled to date. These works are still the richest source of data on the European and Turkish neuropteran fauna. A checklist study published by Canbulat [4] 193 species and 6 subspecies of ten families from Turkey were indicated. In the following years, continuing research in Turkey [5], Koçak and Kemal [6]; Dobosz and Abraham [7, 8]; Canbulat [9]; addition 10 species are recorded. Until 2014, as a result of research conducted Neuroptera in Turkey, includes 11 families (including Sisyridae, Coniopterygidae, Osmylidae, Berothidae, Mantispidae, Dilaridae, Hemerobiidae, Chrysopidae, Myrmeleontidae, Nemopteridae, Ascalaphidae) and 203 species and 6 subspecies are known. According to previous research, 3 species [*Myrmecaelurus major* McLachlan, 1875, *Myrmecaelurus trigrammus* (Pallas, 1771), *Lerth schmidt* H.aspöck & U. Aspöck & Hölzel, 1984] were found in Eskişehir province.

The objective of this study was to provide detailed information on families and their distribution in the Eskişehir province, and to make a contribution to species composition (species distributions of subfamilies and genera), ecological properties of species (faunistic richness, heterogeneity of populations, abundance, dominance of species, habitat affinities, habitat preference, habitat similarity of species) of Neuroptera families of Turkey.

2. Materials and Methods

Eskişehir is at Northwest of Interior Anatolia region. The study area is neighbor to Black Sea region at North, Marmara region at Northwest, Aegean region at Southwest. A little part of Eskişehir is under the influence of Aegean region and Black Sea region. However, the geographical characteristic of Eskişehir is to that of Interior Anatolia region. Area of the province which is surrounded by Bozdag and Sundiken Mountains at North, Emirdag at South, Turkmen Mountain at West is about 13.653 km². That much of area covers 1.8% of Turkey. Elevation of Eskişehir from sea is between 700 and 1700 m.

In this study, between August-October in 2010 and between April-June in 2011, a total number of 791 lacewing specimens (51% females and 49% males) were collected from 68 randomly located sampling 13 county and villages of Eskişehir province in Northwest Turkey. Samples were collected using three methods: beating the vegetation with a hand-net, using a Japanese umbrella, and light-trapping specimens at night (Fig. 1).

Light traps (4 x 3 m) were made from a curtain of tulle with a framework of pipes to hold it taut and flush with the ground. Light bulbs (500W, soft) were obtained from Illumina (www.illumina.com). Generators were

used to provide the power. The light was reflected onto the white cloth. Portable light bulbs were 30 cm behind the cloth, about 1.5 m above the ground.

The samples collected at diagnosis following literatures have been used [10-55].

The relative frequency of the specimens was calculated by dividing the number of samples where a given species occurred by total number of samples multiplied by 100. Where:

Relative frequency (Q) = Number individuals of a species / Total number of individual's x 100 (Ep. 1)

The dominance scale chosen is the following: a species is considered dominant if its frequency (Q) exceeds 50% within the overall sample (Canard et al. 2007); very common if $30 < Q \leq 50\%$; common if $15 < Q \leq 30\%$; uncommon if $5 < Q \leq 15\%$; rare (RAR) if $1 < Q \leq 5\%$; casual (CAS) if $0.1 < Q \leq 1\%$; and exceptional (EXC) if $Q \leq 0.1\%$.

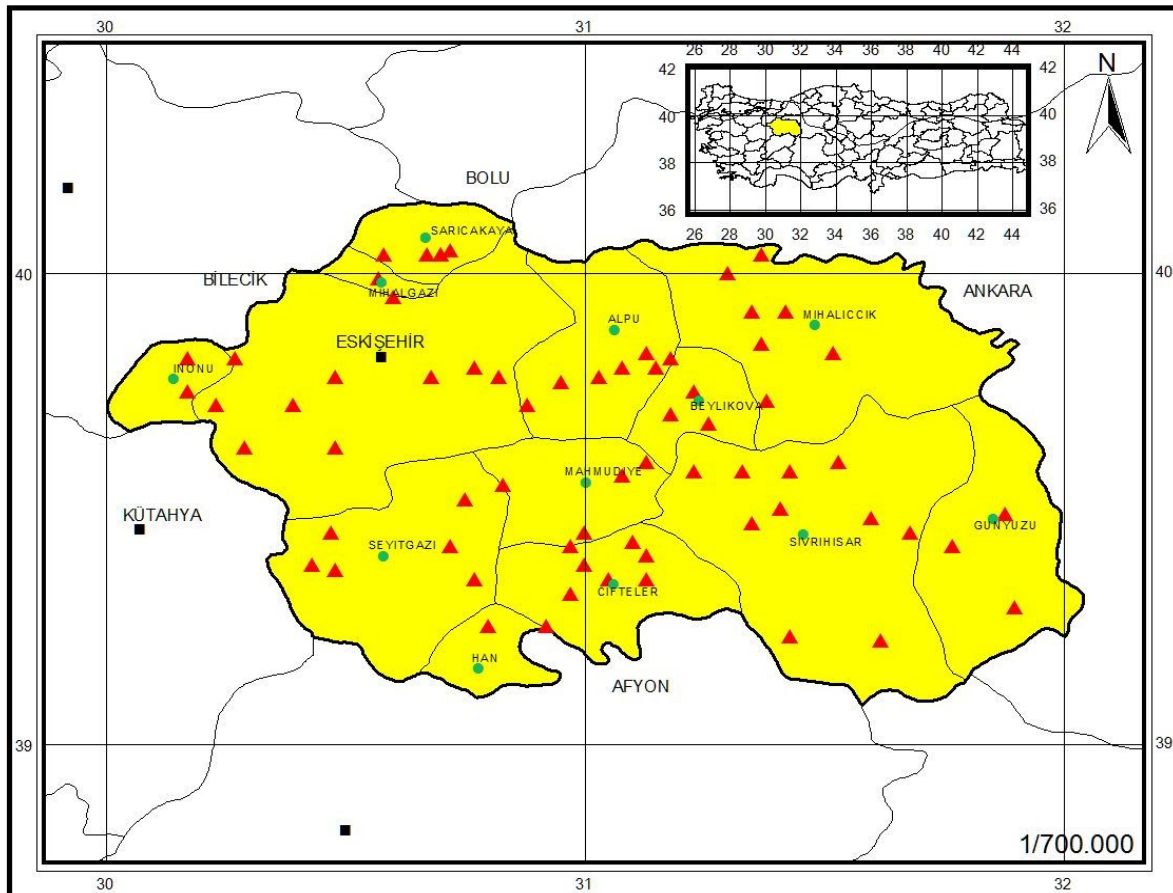


Fig. 1. Map of the Eskişehir Province, Northwest Turkey collecting sites (triangle), and borders between the provinces are depicted by thin lines.

3. Results

In Eskişehir province, collected specimens were determined to belong to 37 species of 7 families, which is 17% of the number of neuropteroids recorded in Turkey. In 37 species, 34 species are new records for the Eskişehir province fauna.

According to the phenological data of 37 species, *Coniopteryx (Coniopteryx) pygmaea*, *Hemerobius lutescens* and *Hemerobius zernyi* in May, *Distoleon tetragrammicus*, *Hemerobius stigma* and *Wesmaelius (Kimminsia) ravus* in June, *Italo-chrysa italic*, *Nineta principiae*, *Neuroleon assimilis*, *Lertha schmidti* and *Nemoptera sinuate* in July, *Wesmaelius (Kimminsia) subnebulosus* and *Aleuropteryx loewii* in August, *Symphorobius (Niremberge) fuscescens* have been found in September (Fig. 2-4).

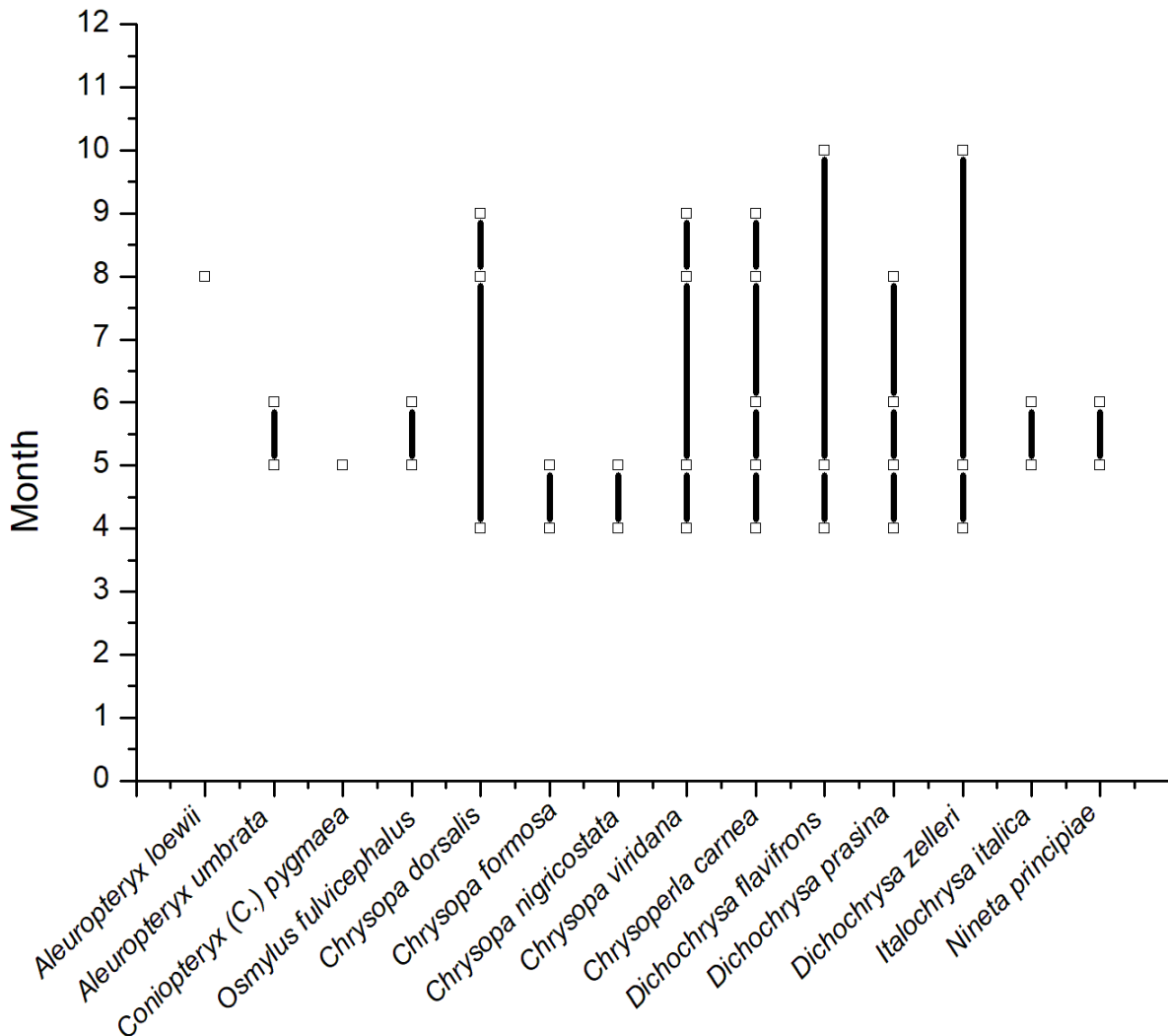


Fig. 2. Chart, Flight activity of species of Coniopterygidae, Osmylidae and Chrysopidae families.

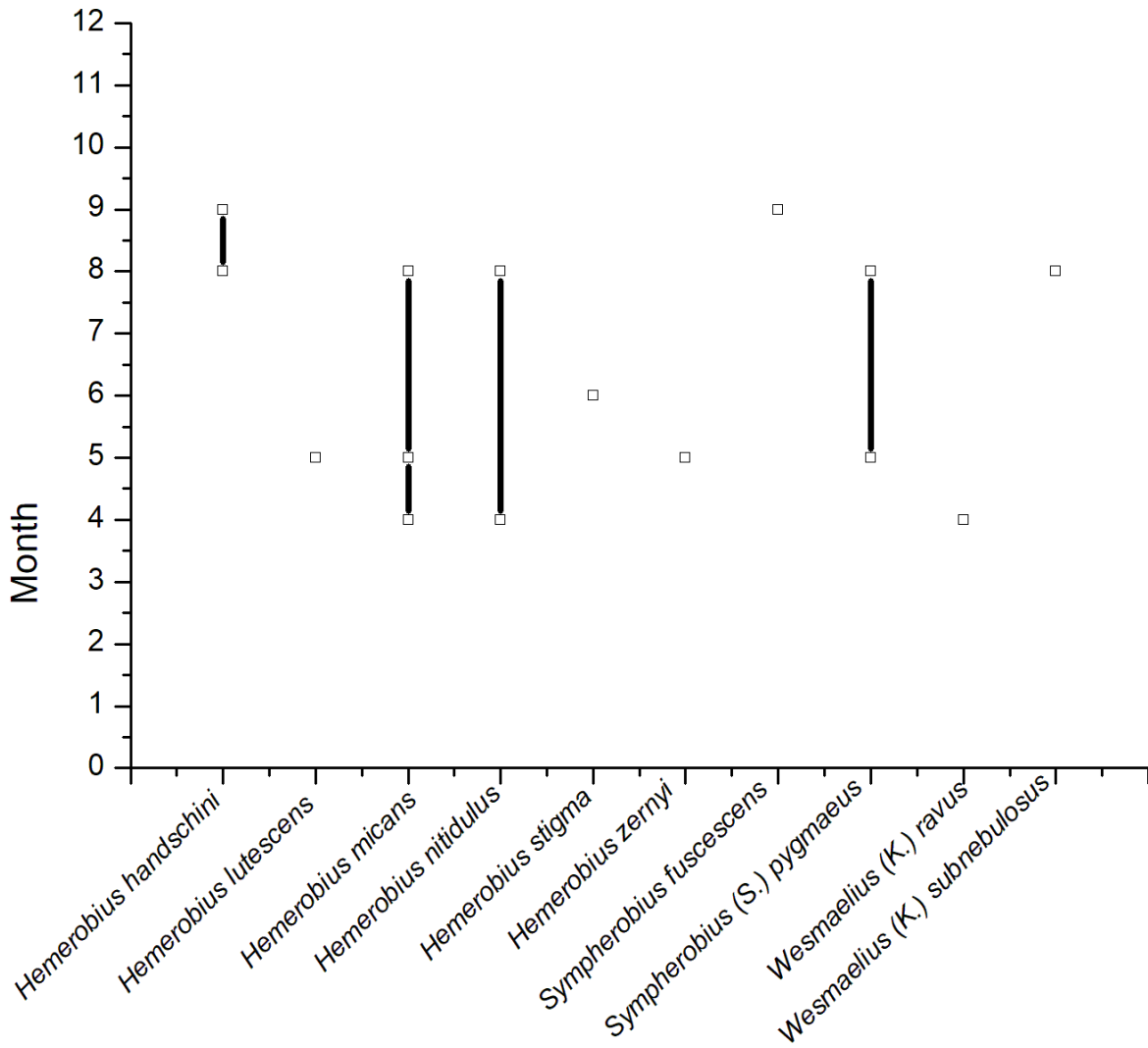


Fig. 3. Flight activity of species of Hemerobiidae families

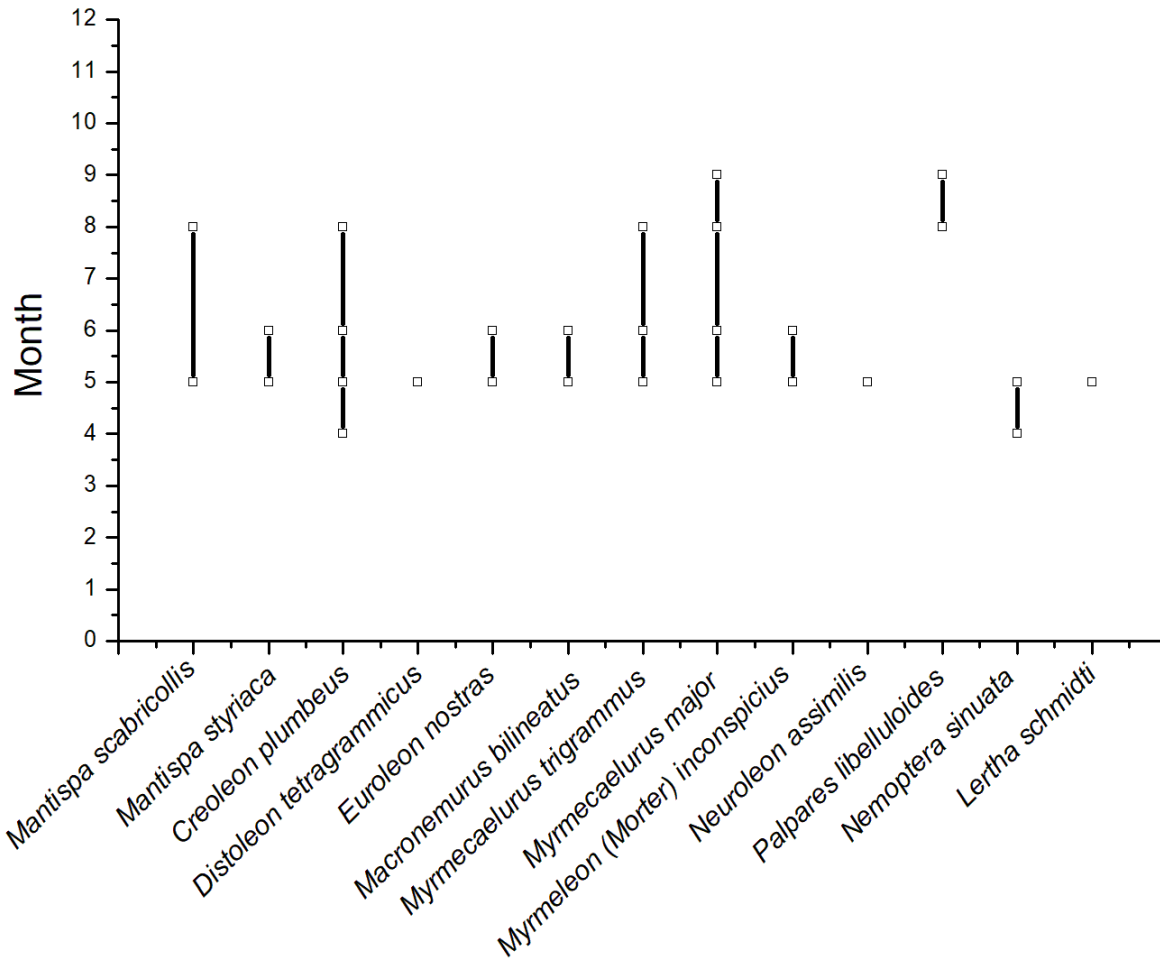


Fig. 4. Flight activity of species of Mantispidae, Myrmeleontidae and Nemopteridae families

In the study area, the following 7 categories of ecosystem and habitat types were used: coniferous trees, deciduous trees, ferns, shrub, herb, others type (open areas of forest, open steppes, under the bridge) and light trap (Table 1).

Chrysoperla was the most species-rich and abundant genus, comprising more species than the sum of all the other genera included (Table 2). The most frequently caught species with number of specimens and percent dominance values of respectively were *Chrysoperla carnea* (161, 20,35%) and relatively abundant (COM.). This species found all other habitat types except for types open areas of forest and others type. Then four species are relatively uncommon (UNC.). They are *Chrysopa dorsalis* (86, 10,87), *Hemerobius handschini* (67, 8,47%), *Myrmecaelurus trigrammus* (90, 11,38%), *Palpares libelluloides* (54, 6,83%) which can be found on coniferous trees, deciduous trees, shrub and light trap. 14 species belong to rare species (RAR.) (Table 2).

The literature of lacewing ecology is abundant; for instance, Zeleny [56] gave rich information on chrysopid occurrence in west-Palaeartic temperate forest and derived biotopes, Monserrat and Marín [57-60] on substrate specificity of Coniopterygidae, Chrysopidae and Hemerobiidae, Szentkirályi [61] on habitat relationships. Gruppe and Sobek [62] mentioned effect of tree species diversity on the neuropterid community in a deciduous forest. However, my and these contributions do not quantify indicators of biodiversity. It is, necessary to do more work.

4. Conclusion

I conclude that for neuropterid communities in forest stands of different tree diversity, the habitat heterogeneity is effective. Further investigations will provide more data on the substrate specificity of the lacewing species studied here, especially for those not clearly associated with the Turkey plant substrates considered. Likewise, studies in the Turkey and other countries could provide interesting data for comparing behavior on plant substrate preferences.

Table 1. Total number of species collected on harboring plants, in Eskişehir Province

Habitat categories	Family	Species	Total number of species
Coniferous Trees	Pinaceae	<i>Pinus nigra ssp. nigra</i>	28
		<i>Pinus sylvestris</i>	23
		<i>Picea orientalis</i>	5
	Cupressaceae	<i>Juniperus oxycedrus ssp. oxycedrus</i>	8
Deciduous Trees	Fagaceae	<i>Quercus petrae ssp. iberica</i>	17
		<i>Quercus robur ssp. robur</i>	10
	Corylaceae	<i>Corylus avellana</i>	2
		<i>Ostrya carpinifolia</i>	1
	Betulaceae	<i>Carpinus betulus</i>	2
	Cornaceae	<i>Cornus mas</i>	2
	Aceraceae	<i>Acer campestre ssp. campestre</i>	1
	Rosaceae	<i>Mespilus germanica</i>	2
<i>Prunus spinosa ssp. dasphylla</i>		2	
Ferns	Aspidiaceae	<i>Dryopteris filix-mas</i>	1
Shrubs	Rhamnaceae	<i>Paliurus spina-christii</i>	1
	Ericaceae	<i>Rhododendron ponticum ssp. ponticum</i>	1
Herbs	Umbelliferae	<i>Heracleum platytaenium</i>	1
	Gramineae	<i>Phragmites australis</i>	1
Others type	Open areas of mixed forest		1
	Open stepps		3
	Under the bridge		1
Light trap	Light trap (500 w)		20

Table 2. Species composition and dominance of species from randomly located sampling stations in Eskişehir, their representation (dominance) in percentages and comparison with families according to number of occurrence of the species in individuals.

Number	Family	Species	Total (N)	Relative frequency (%)	abundance scale
1	Coniopterygidae	<i>Aleuropteryx loewii</i>	18	2,28	RAR
2		<i>Aleuropteryx umbrata</i>	20	2,53	RAR
3		<i>Coniopteryx (Coniopteryx) pygmaea</i>	15	1,90	RAR
4	Osmylidae	<i>Osmylus fulvicephalus</i>	4	0,51	CAS
5	Chrysopidae	<i>Chrysopa dorsalis</i>	86	10,87	UNC
6		<i>Chrysopa formosa</i>	4	0,51	CAS
7		<i>Chrysopa nigricostata</i>	16	2,02	RAR
8		<i>Chrysopa viridana</i>	20	2,53	RAR
9		<i>Chrysoperla carnea</i>	161	20,35	COM
10		<i>Dichochrysa flavifrons</i>	12	1,52	RAR
11		<i>Dichochrysa prasina</i>	38	4,80	RAR
12		<i>Dichochrysa zelleri</i>	18	2,28	RAR
13		<i>Nineta pallida</i>	4	0,51	CAS
14		<i>Nineta principiae</i>	4	0,51	CAS
15		Mantispidae	<i>Mantispa scabricollis</i>	4	0,51
16		<i>Mantispa styriaca</i>	5	0,63	CAS
17	Nemopteridae	<i>Nemoptera sinuata</i>	10	1,26	RAR
18		<i>Lertha schmidti</i>	8	1,01	RAR
19	Hemerobiidae	<i>Hemerobius handschini</i>	67	8,47	UNC
20		<i>Hemerobius lutescens</i>	4	0,51	CAS
21		<i>Hemerobius micans</i>	10	1,26	RAR
22		<i>Hemerobius nitidulus</i>	2	0,25	CAS
23		<i>Hemerobius stigma</i>	5	0,63	CAS

24		<i>Hemerobius zernyi</i>	3	0,38	CAS
25		<i>Symphorobius (Niremberge) fuscescens</i>	3	0,38	CAS
26		<i>Symphorobius (Symphorobius) pygmaeus</i>	3	0,38	CAS
27		<i>Wesmaelius (Kimminsia) ravus</i>	3	0,38	CAS
28		<i>Wesmaelius (Kimminsia) subnebulosus</i>	14	1,77	RAR
29	Myrmeleontidae	<i>Creoleon plumbeus</i>	29	3,67	RAR
30		<i>Distoleon tetragrammicus</i>	5	0,63	CAS
31		<i>Euroleon nostras</i>	7	0,88	CAS
32		<i>Macronemurus bilineatus</i>	6	0,76	CAS
33		<i>Myrmecaelurus trigrammus</i>	90	11,38	UNC
34		<i>Myrmecaelurus major</i>	30	3,79	RAR
35		<i>Myrmeleon (Morter) inconspicius</i>	5	0,63	CAS
36		<i>Neuroleon assimilis</i>	4	0,51	CAS
37		<i>Palpares libelluloides</i>	54	6,83	UNC

References

- [1]. New TR. 2001. Introduction to the Neuroptera: what are they and how do they operate? In: McEwen PK, New TR, Whittington AE, Editors. *Lacewings in the Crop Environment*. Cambridge University Press, New York, NY, pp. 546.
- [2]. Aspöck, H., Hölzel, H., Aspöck, U., Kommentierter Katalog der Neuropterida (Raphidioptera, Megaloptera, Neuroptera) der Westpaläarktis, *Denisia* 2, 1-606 pp (2001).
- [3]. Aspöck, H., Aspöck, U., Hölzel, H., Die Neuropteren Europas. Eine zusammenfassende Darstellung der Systematik, Ökologie und Chorologie der Neuropteroidea (Megaloptera, Raphidioptera, Planipennia) Europas, *Goecke & Evers*, Krefeld, 1: 1-495, 2, 1-355, (1980).
- [4]. Canbulat S. 2007a. A checklist of Turkish Neuroptera with annotating on provincial distributions. *Zootaxa* 1552: 35-52.
- [5]. Rausch H, Weißmaier W. 2007. *Sisyra bureschi* nov.sp. und *S. corona* nov.sp. - zwei neue Schwammhafte und Beiträge zur Faunistik der Sisyridae (Insecta, Neuroptera) Südosteuropas. *Linzer Biologische Beiträge* 39(2): 1129-1149.
- [6]. Koçak AÖ, Kemal, M. 2008. Description of a new species *Echthromyrmex sehitlerolmez* sp. N. (Planipennia, Myrmeleonidae) from South East Turkey. *Miscellaneous Papers Centre for Entomological Studies* 138: 4-5.
- [7]. Dobosz R, Ábrahám L. 2007. New data to the Turkish ascalaphid fauna (Neuroptera: Ascalaphidae). *Annals of the Upper Silesian Museum (Entomology)* 14-15: 13-27.
- [8]. Dobosz R, Abraham L. 2009. Contribution to the knowledge of the Turkish tail-wings (Neuroptera: Nemopteridae). *Natura Somogyiensis* 15: 113-126.
- [9]. Canbulat S. 2013. Two new records of *Coniopteryx* (Neuroptera: Coniopterygidae) species for the Turkish fauna. *Turkish Journal of Zoology*, 37: 242-245.
- [10]. Ábrahám, L, Vizsgalatok Az Eszaki-Közephegyseg Neuropteroidea Faunajan, Különös Tekintettel A Matra Hegysegre (Neuropteroidea, Megaloptera, Raphidioptera, Neuroptera), *Acta Academiae Agriensis Nova Series*, 21(1), 125-154, (1995).
- [11]. Ábrahám, L., Untersuchungen zur Neuropteroideen-Fauna (Megaloptera, Raphidioptera, Neuroptera) des geplanten Duna-Drava Nationalparkes (Ungarn) in Hinsicht des Naturschutzes I, *Dunantuli Dolg. Term. tud. Sorozat*, 8, 53-70, (1995).
- [12]. Aspöck, H., Aspöck, U, Die Neuropteren Vorderasiens. I. Coniopterygidae, *Beiträge zur Naturkundlichen Forschung in Südwestdeutschland*, 24(2), 159-181, (1965).

- [13]. Aspöck, H., Aspöck, U., Die Neuropteren Mitteleuropas. Ein Nachtrag zur synopsis der systematik. Ökologie und Biogeographia der Neuropteren Mitteleuropas, *Naturkundliches Jahrbuch der Stadt*, 17-68, (1969).
- [14]. Aspöck, H., Aspöck, U., Hölzel, H., Neue Spezies der Genera *Kirbynia* Navas und *Lertha* Navas aus Vorderasien und Bemerkungen über *Olivierina extensa* (Olivier) (Neuropteroidea: Planipennia: Nemopteridae), *Entomologische Zeitschrift*, 94, 113-121, (1984).
- [15]. Aspöck, H., Aspöck, U., Neue Dilariden aus Asien (Neuroptera, Planipennia), *Entomologisches Nachrichtenblatt*, 14, 56-59, (1967).
- [16]. Aspöck, H., Aspöck, U., Neue Hemerobiiden aus Vorderasien (Insecta, Planipennia), *Entomologisches Nachrichtenblatt*, 13, 74-80, (1966).
- [17]. Aspöck, H., Aspöck, U., Vorläufige Mitteilung über die Coniopterygiden Vorderasiens (Neuroptera), *Entomologisches Nachrichtenblatt*, 12, 17-23, (1965).
- [18]. Aspöck, H., Aspöck, U., Zwei weitere neue Spezies des Genus *Dilar* Rambur (Neuroptera, Planipennia) aus Asien. (Vorläufige Mitteilung), *Entomologisches Nachrichtenblatt*, 15, 3-6, (1968).
- [19]. Aspöck, H.; Aspöck, U., Die Neuropteren Mitteleuropas - eine faunistische und zoogeographische Analyse, *Abhandlungen und Berichte des Naturkundemuseums Görlitz*, 44, 31-48, (1969).
- [20]. Aspöck, U., Aspöck, H., *Nyrma kervillea* Navas - Wiederentdeckung einer systematisch isolierten Hemerobiiden-Spezies in Kleinasien, *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 31(3/4), 92-96, (1979).
- [21]. Aspöck, U., Aspöck, H., Zur Nomenklatur der Mantispiden Europas (Insecta: Neuroptera: Mantispidae), *Ann. Nat. Mus. Wien.*, 99B, 99-114, (1994).
- [22]. Aspöck, U., Die Mantispiden Europas (Neuropteroidea: Neuroptera: Mantispidae).-In *Verhandlungen des 14. Internationalen Symposiums über Entomofaunistik in Mitteleuropa, 4-9 September 1994*, 224-230, (1996).
- [23]. Brooks, S. J., Barnard P. C., The green lacewing of the world: a generic review (Neuroptera: Chrysopidae), *Bulletin British Museum Natural History (entomology Series)*, 59(2), 117-286, (1990).
- [24]. Canard, M., Cloupeau, R., Leraut, P., Les Chrysopes du genre *Nineta* Navás, 1912, en France (Neuroptera, Chrysopidae). *Bulletin de la Société Entomologique de France*, 103(4), 327-336, (1998).
- [25]. Esben-Petersen, P., Two new species of Neuroptera, *Konowia*, 14, 151-153, (1935).
- [26]. Greve, L., An aerial-drift of Neuroptera from Hardangervidda, western Norway, *Arbok for Universitetet i Bergen (Matematisk-Naturvitenskapelig Serie)*, 2, 1-15, (1969).
- [27]. Günther, K. K., Welche Art muss *Coniopteryx pygmaea* Enderlein, 1906 heissen (Neuroptera, Coniopterygidae), *Dtsch. entonol. Z.*, 40(1), 167-171, (1993).
- [28]. Hölzel, H., Beitrag zur Kenntnis der Chrysopidae: Die *Nineta* gruppe, *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 17(3), 91-98, (1965).

- [29]. Hölzel, H., Beitrag zur Kenntnis der Gattung *Suarius* Navas, Die Arten des Nanus-Komplexes (Planipennia, Chrysopidae), *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 30, 3-12, (1978).
- [30]. Hölzel, H., Biogeography of Palearctic Myrmeleonidae (Neuropteroidea: Planipennia), 53-70, *J. Gepp, H. Aspöck, H. Hölzel, (eds.), -In Recent Research in Neuropterology. Proceedings of the 2nd International Symposium on Neuropterology, Graz, Austria, (1986).*
- [31]. Hölzel, H., Die Netzflüger Kärntens 1. Nachtrag, *Carinthia II*, 163/83:497-506, (1973).
- [32]. Hölzel, H., Die Neuropteren Vorderasiens IV. Myrmeleonidae, *Beiträge zur Naturkundlichen Forschung In Südwestdeutschland*, 1, 3-103, (1972).
- [33]. Hölzel, H., Eine neue Chrysopiden-Art aus Südeuropa - *Anisochrysa (Cunctochrysa) baetica* n. sp. (Planipennia, Chrysopidae), *Entomofauna Zeitschrift*, 82(19), 217-221, (1972).
- [34]. Hölzel, H., Neue oder wenig bekannte Chrysopiden aus der Sammlung des Naturhistorischen Museums (Chrysopidae, Planipennia), *Ann. Nat. Mus. Wien.*, 68, 453-463, (1965).
- [35]. Hölzel, H., Notes on ant-lions (Neuroptera: Myrmeleonidae) of Israel and adjacent countries, with descriptions of new species, *Israel Journal of Entomology*, 14, 29-46, (1980).
- [36]. Hölzel, H., Revision der europäischen *Creoleon*-Arten (Planipennia, Myrmeleonidae), *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 23, 33-38, (1976).
- [37]. Meinander, M., A revision of the family Coniopterygidae (Planipennia), *Acta Zoologica Fennica*, 136, 1-357, (1972).
- [38]. Mirmoayedi, A., Yassayie A., *Dilar golestani* sp. n. (Neuroptera: Dilaridae) from Iran, *Journal of Entomological Society of Iran*, 18(1-2):9-15, (1999).
- [39]. Monserrat, V. J., Contribucion al conocimiento de los Neuropteros de Italia (Neuroptera, Planipennia), *Neuroptera International*, 1, 48-64, (1980).
- [40]. Monserrat, V. J., Revision de la obra de L. Navas, I: El genero *Dilar* Rambur, 1842 (Neuropteroidea, Planipennia: Dilaridae), *Neuroptera International*, 5(1), 13-23, (1988).
- [41]. Monserrat, V. J., Revision de las especies de *Lertha* del Mediterraneo occidental (Neuropteroidea, Planipennia: Nemopteridae), *Annali del Museo Civico di Storia Naturale Giacomo Doria*, 87, 85-113, (1988).
- [42]. Navas, L., Insecta orientalia. IV series, *Memorie dell'Accademia Pontifica dei Nuovi Lincei*, (2)9:111-120, (1926).
- [43]. Navas, L., Insecta orientalia. V Series, *Memorie dell'Accademia Pontifica dei Nuovi Lincei*, (2)10:11-26, (1927).
- [44]. Popov, A., Die Hemerobiiden der Mongolei (Neuroptera), *Acta Entomologica Bohemoslovaca*, 83, 294-300, (1986).
- [45]. Popov, A., Hemerobiiden aus Bulgarien (Neuroptera), *Mitteilungen aus dem Zoologischen Museum in Berlin*, 62, 323-331, (1986).

- [46]. Popov, A., Verbreitung der europäischen Nemopteriden-Arten (Neuroptera), Academie Bulgare Des Sciences, *Bulletin De L'Institut De Zoologie Et Musee*, 32, 5-31, (1970).
- [47]. Rausch, H., Aspöck, H., Aspöck, U., Beschreibung von *Helicoconis sengonca* n. sp., einer neuen Coniopterygiden-Spezies aus Anatolien, und Bemerkungen über *Helicoconis aptera* Messner, 1965 (Neuropteroidea, Planipennia), *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 30(1/2), 25-28, (1978).
- [48]. Rausch, H., Aspöck, H., Drei neue Spezies des Genus *Coniopteryx* Curtis (Neuroptera, Coniopterygidae) aus dem Iran, *Z. Arb. Gem. öst. Ent.*, 29, 100-103, (1978).
- [49]. Rausch, H., Aspöck, H., Ohm, P., Zwei weitere neue Arten des Genus *Aleuropteryx* aus der Westpaläarktis (Neuroptera, Coniopterygidae), *Ent. Z., Frankf. a.M.* 88, 45-49, (1978).
- [50]. Rausch, H., Aspöck, H., Zwei neue Spezies des Genus *Nimboa* Navas (Neuroptera, Coniopterygidae) aus Vorderasien, *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 30(1/2), 13-16, (1978).
- [51]. Şengonca, Ç., Beitrag zur Neuropterenfauna der Türkei, *Nachrichtenblatt der Bayerischen Entomologen*, 28(1):10-15, (1979).
- [52]. Şengonca, Ç., Die Neuropteren Anatoliens.1. Chrysopidae, *Mitteilungen der Münchener Entomologischen Gesellschaft*, 71, 121-137, (1981).
- [53]. Şengonca, C., Neuroptera'ların toplanma, tanıya hazırlama and genital preparasyonlarının yapılma yöntemlerinin esasları, *Türkiye Bitki Koruma Dergisi*, 4(2), 131-138, (1980).
- [54]. Şengonca, Ç., Türkiye Chrysopidae (Neuroptera) Faunası Üzerine Sistemik and Taksonomik Araştırmalar, *T.C. Gıda- Tarım and Hayvancılık Bakanlığı, Zirai Mücadele and Zirai Karantina Genel Müdürlüğü Matbaa Şubesi Müdürlüğü*, 1-138, (1980).
- [55]. Şengonca, Ç., Türkiye Mantisidae (Insecta: Neuroptera) faunası üzerinde taksonomik araştırmalar, *Tübitak VII. Bilim kongresi, TBAG Biyoloji Seksiyonu*, 545, 457-473, (1980).
- [56]. Zelený J. 1984. Chrysopids occurrence in west palearctic temperate forests and derived biotopes. In: Canard M, Séméria Y, New TR, Editors. pp. 151-160. *Biology of Chrysopidae*. The Hague, Boston, Lancaster, Dr. W. Junk Publish.
- [57]. Monserrat VJ, Marín F. 1992. Substrate specificity of Iberian Coniopterygidae (Insecta: Neuroptera). In: Canard M, Aspöck H, Mansell MW, Editors. pp. 279-290. *Current Research in Neuropterology. Proceedings of the Fourth International Symposium on Neuropterology*.
- [58]. Monserrat VJ, Marín F. 1994. Plant substrate specificity of Iberian Chrysopidae (Insecta: Neuroptera). *Acta Oecologica: International Journal of Ecology* 15: 119-131.
- [59]. Monserrat VJ, Marín F. 1996. Plant substrate specificity of Iberian Hemerobiidae (Insecta: Neuroptera). *Journal of Natural History* 30: 775-787.

- [60]. Monserrat VJ, Marín F. 2001. Comparative plant substrate specificity of Iberian Hemerobiidae, Coniopterygidae and Chrysopidae. In: McEwen PK, New TR, Whittington AE, Editors. pp. 424-434. *Lacewings in the crop environment*. Cambridge University Press, Cambridge.
- [61]. Szentkirályi F. 2001. Ecology and habitat relationships. In: McEwen PK., New TR., Whittington AE. Editors. pp. 82-115. *Lacewings in Crops Environment, Cambridge University Press, Cambridge, UK*.
- [62]. Gruppe A, Sobek S. 2011. Effect of Tree Species Diversity on the Neuropterid Community in a Deciduous Forest. *Acta Entomologica Slovenica* 19(1): 17–28.