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An Investigation on Cicadellidae (Insecta, Hemiptera) Fauna of Boğazköy-Alacahöyük National Park and its Surrounding, Turkey

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Abstract: In the current study, it was aimed to determine the Cicadellidae (Insecta, Hemiptera) fauna of Boğazköy-Alacahöyük National Park and its surroundings. Field study was carried out periodically at April-September 2015, and materials were collected by insect net in the daytime. These specimens were prepared according to standard methods in the laboratory and identified by comparing with literature and museum specimens. Fourteen species belonging to the Cicadellidae family were determined. These species were *Anaceratagallia ribauti* (Ossiannilsson, 1938), *Anaceratagallia laevis* Ribaut, 1931, *Austroagallia sinuata* (Mulsant & Rey 1855), *Eupelix cuspidata* (Fabricius, 1775), *Goniagnathus brevis* (Herrich-Schaffer, 1835), *Doratura homophyla* (Flor, 1861), *Doratura stylata* (Boheman, 1847), *Phlepsius ornatus* (Perris, 1857), *Hardya anatolica* Zachvatkin, 1946, *Mocydiopsis parvicauda* Ribaut, 1939, *Euscelis lineolatus* Brullé 1832, *Artianus manderstjernii* (Kirschbaum, 1868), *Psammotettix striatus* (Linnaeus, 1758), *Diplocolenus bekiri* Kalkandelen, 1972. Number of examined specimens and distributions of species in Turkey and globally have been given. Excluding the species *P. striatus*, all of the determined species were new record for the study area and Çorum province.

Keywords: Cicadellidae, Boğazköy, Alacahöyük, fauna, Hemiptera.

I. INTRODUCTION

Cicadellidae belongs to order Hemiptera, and have many species. They are found in many terrestrial ecosystems in high concentrations. Their functional importance is exactly unknown. Insects belonging to this group move by leaping. On the body, wings are patterned with different colors and shapes. When resting, wings will stop to form a roof over the abdomen.

They feed by sucking the plant sap with their piercing-sucking mouthparts. Therefore, species belonging to this group are known as plant pests and negatively affect plant growth directly or indirectly. In addition, toxic substances which they secrete while sucking plants can lead to abnormal growth, damages and even death of plant tissues and cells.

The first study on Cicadellidae family in Turkey was carried out by Fahringer [1]. Fahringer [1] reported a species as a new record for Turkish fauna. Then, Zachvatkin [2, 3] made the original definition of the five species and reported a new record for the fauna of Turkey. A significant part of the studies in Turkey was carried out by Dlabola [4, 5, 6, 7, 8, 9, 10]. Dlabola made the original definition of a genera and eighteen species, and reported 79 species as new records. Linnavuori [11] reported 5 species as new records for Turkish fauna. Kalkandelen [12, 13] made the original definition of a new genus and 4 species and a subspecies, and reported twenty species as new records. Kartal [14, 15] made the original definition of 3 species, and reported thirteen species as new records. Lodos and Kalkandelen [16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26] listed 214 species belonging the Deltocephalinae subfamily which distribute in Turkey, and 42 species of these were new records. Original description of a species was made by Abdul-Nour [27]. Kartal and Zeybekoğlu [28, 29, 30, 31, 32, 33] made the original definition of a species, and reported 16 species as new records. Başpınar and Uygun [34, 35, 36, 37] reported 3 species; Zeybekoğlu [38, 39, 40, 41] reported 3 species; Güçlü and Özbek [42, 43, 44, 45, 46, 47] reported 9 species; Zeybekoğlu and Bulut [48] reported 2 species; Kartal, Zeybekoğlu and Dursun [49] reported 2 species; Karavin, Zeybekoğlu and Kartal [50] reported one species as new records for Turkish fauna.

The current study was aimed to determine the fauna of Cicadellidae family in the Boğazköy-Alacahöyük national park. It was thought that determining the species belonging to Cicadellidae family by this study contribute to Hemiptera fauna and biodiversity of Turkey. Because these insects prevent normal growth of plants and cause spread of plant diseases in a short time, results of this study is also economically important.

II. MATERIAL AND METHOD

Specimens belonging to the Cicadellidae species were collected in the Bogazköy-Alacahöyük National Park and its vicinity, Turkey. Field study was carried out periodically between April and September 2015. Materials were collected by insect nets from different

plant parts as branch, leaf, stem etc. These specimens were prepared according to standardized method and taxonomic characters such as body shape, size and structures, genital structures, coloring, spotting and designing were examined detailed. Taxonomic characters of specimens were compared with dichotomous keys and descriptions.

III. RESULTS

In this study, 14 species belonging to Cicadellidae family were determined in Boğazköy-Alacahöyük National Park and its surroundings. Except *Psammotettix striatus*, all of the other species were identified as new records for the study area and Çorum.

- 1) *Subfamily*: Agalliinae Kirkaldy, 1901
- 2) *Tribus*: Agalliini Kirkaldy, 1901
- 3) *Genus*: Anaceratagallia
- 4) *Species*: Anaceratagallia ribauti (Ossiannilsson, 1938)
- 5) *Material examined*: 9♂♂, 4♀♀, 27.09.2015, Alacahöyük.
- 6) *Distribution in Turkey*: Adana, Ankara, Antalya, Balıkesir, Çankırı, Hatay, İçel, İzmir, Malatya, Mardin, Samsun [51, 52].
- 7) *Zoogeographic Distribution*: Albania, Armenia, Austria, Belgium, Bulgaria, Czech Republic, England, Estonia, Finland, France, Georgia, Germany, Greece, Holland, Italy, Moldova, Morocco, Poland, Portugal, Romania, Russia, Slovakia, Sweden, Switzerland, Turkey, Ukraine, Wales [53].
- 8) *Species*: Anaceratagallia laevis Ribaut, 1931
- 9) *Material examined*: 1♂, 2♀♀, 16.07.2015, 1♂, 1♀, 16.08.2015, 2♂♂, 6♀♀, 27.09.2015, Alacahöyük.
- 10) *Distribution in Turkey*: Adana, Ağrı, Ankara, Bilecik, Erzurum, Eskişehir, İçel, İstanbul, İzmir, Konya, Malatya, Nevşehir [51, 52].
- 11) *Zoogeographic Distribution*: Afghanistan, Albania, Bulgaria, Cyprus, Egypt, France, Greece, Hungary, Iran, Iraq, Israel, Italy, Jordan, Morocco, Portugal, Romania, Russia, the Canary Islands, Turkey [53].
- 12) *Genus*: Austroagallia Evans, 1935
- 13) *Species*: Austroagallia sinuata (Mulsant & Rey 1855)
- 14) *Material examined*: 1♂, 17.08.2015, Boğazköy.
- 15) *Distribution in Turkey*: Adana, Ankara, Bursa, Diyarbakır, Erzincan, Erzurum, Gaziantep, Hakkari, Iğdır, İçel, İzmir, Kars, Kırşehir, Mardin, Muğla, Nevşehir, Samsun, Siirt, Şırnak [51, 52, 54]
- 16) *Zoogeographic Distribution*: Albania, Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Czech Republic, Egypt, France, Georgia, Greece, Iraq, Israel, Kazakhstan, Kyrgyzstan, Libya, Moldova, Morocco, Portugal, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Syria, Tajikistan, Tunisia, Turkey, Uzbekistan [53].
- 17) *Subfamily*: Dorycephalinae Oman, 1943
- 18) *Genus*: Eupelix Germar, 1821
- 19) *Species*: Eupelix cuspidata (Fabricius, 1775)
- 20) *Material examined*: 1♂, 28.06.2015, Alacahöyük; 1♂, 28.06.2015, Boğazköy. *Distribution in Turkey*: Adana, Adıyaman, Afyonkarahisar, Ankara, Artvin, Çanakkale, Diyarbakır, Erzurum, İçel, Kahramanmaraş, Konya, Malatya, Mardin, Nevşehir, Niğde, Şanlıurfa [52, 55]. *zoogeographic Distribution*: Albania, Algeria, Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Egypt, England, Estonia, Finland, France, Georgia, Germany, Hungary, Iraq, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Moldova, Mongolia, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Scotland, Siberia, Slovakia, Spain, Sweden, Switzerland, Syria, Tajikistan, Tunisia, Turkey, Ukraine, Uzbekistan, Wales [52, 53, 55].
- 21) *Subfamily*: Deltocephalinae Fieber, 1869
- 22) *Tribus*: Goniagnathini Wagner, 1951
- 23) *Genus*: Goniagnathus Fieber, 1866
- 24) *Species*: Goniagnathus brevis (Herrich-Schaffer, 1835)
- 25) *Material examined*: 1♂, 16.08.2015, Alacahöyük; 5♂♂, 6♀♀, 16.08.2015, 5♂♂, 30.08.2015, Boğazköy.
- 26) *Distribution in Turkey*: Adana, Ankara, Burdur, Diyarbakır, Edirne, Manisa, Mardin, Niğde, Samsun [16, 52]. *Zoogeographic Distribution*: Albania, Algeria, Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Cyprus, Czech Republic, France, Georgia, Germany, Hungary, Iran, Israel, Italy, Kazakhstan, Kyrgyzstan, Moldova, Morocco, Netherlands, Poland, Portugal, Romania, Russia, Slovakia, Spain, Sweden, Tajikistan, Tunisia, Turkey, Ukraine [53].
- 27) *Tribus*: Doraturini Ribaut, 1952

- 28) *Genus*: Doratura J. Sahlberg, 1871
29) *Species*: Doratura homophyla (Flor, 1861)
30) *Material examined*: 1♂, 28.06.2015, Boğazköy.
31) *Distribution in Turkey*: Adana, Ankara, Bolu, Bursa, Diyarbakır, Eskişehir, Gaziantep, İzmir, Manisa, Van [52].
32) *Zoogeographic Distribution*: Albania, Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Iraq, Israel, Kazakhstan, Kyrgyzstan, Latvia, Moldova, Mongolia, Netherlands, Poland, Romania, Russia, Siberia, Slovakia, Sweden, Italy, Turkey, Ukraine, Uzbekistan [53]. Armenia, Bulgaria, Georgia, Romania, Turkey [53].
33) *Genus*: Mocydiopsis Ribaut, 1939
34) *Species*: Mocydiopsis parvicauda Ribaut, 1939
35) *Material examined*: 2♂♂, 4♀♀, 16.08.2015, Boğazköy.
36) *Distribution in Turkey*: Amasya, Ankara, Isparta, Nevşehir, Samsun, Sinop, Tokat [52].
37) *Zoogeographic Distribution*: Austria, Belgium, Bulgaria, Czech Republic, England, France, Germany, Holland, Italy, Sweden, Turkey [52, 53].
38) *Genus*: Euscelis Brullé 1832
39) *Species*: Euscelis lineolatus Brullé 1832
40) *Material examined*: 2♂♂, 09.05.2015, 1♂, 2♀♀, 28.06.2015, 2♂♂, 1♀, 16.07.2015, 26♂♂, 46♀♀, 16.08.2015, 11♂♂, 19♀♀, 30.08.2015, 1♂, 1♀, 17.09.2015, Alacahöyük; 6♂♂, 4♀♀, 16.08.2015, 1♂, 2♀♀, 30.08.2015, Boğazköy.
41) *Distribution in Turkey*: Ankara, Artvin, Balıkesir, Bursa, İstanbul, İzmir, Kırıkkale, Kırklareli, Kırşehir, Konya, Malatya, Manisa, Niğde, Samsun, Trabzon, Uşak [52].
42) *Zoogeographic Distribution*: Albania, Algeria, Azerbaijan, Bulgaria, England, France, Germany, Greece, Hungary, Ireland, Italy, Jordan, Morocco, Netherlands, Portugal, Spain, Switzerland, Tunisia, Turkey, Uzbekistan, Wales [52, 53].
43) *Genus*: Artianus Ribaut, 1942
44) *Species*: Artianus manderstjernii (Kirschbaum, 1868)
45) *Material examined*: 12♂♂, 3♀♀, 28.06.2015, 1♂, 1♀, 17.09.2015, Alacahöyük; 11♂♂, 3♀♀, 28.06.2015, 78♂, 52♀♀, 16.07.2015, 3♂♂, 22♀♀, 16.08.2015, 22♂♂, 18♀♀, 30.08.2015, 40♂♂, 36♀♀, 17.09.2015, 18♂♂, 22♀♀, 27.09.2015, Boğazköy.
46) *Species*: Diplocolenus bekiri Kalkandelen, 1972
47) *Material examined*: 4♂♂, 1♀, 07.06.2015, 9♂♂, 19♀♀, 28.06.2015, Alacahöyük.
48) *Distribution in Turkey*: Ankara, Samsun, Sivas [12, 52].
49) *Zoogeographic Distribution*: Turkey [12].

IV. DISCUSSION

Species belonging to Cicadellidae family damage plants directly by feeding and laying egg, and indirectly by transporting and spreading pathogens. Thus, some of the species of this family are agricultural agent and so economically important. By this study, species belonging to Cicadellidae family were determined in the study area. Besides faunistic contribution of this study to biological diversity of Turkey and zoogeography of the World, these findings were also important for agricultural activities in the vicinity of the study area. Until this study, no study was found in the literature on Cicadellidae family in Çorum in which agriculture is an important activity.

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