TRAKYA UNIVERSITY
JOURNAL OF NATURAL SCIENCES
23 Volume Special Issue: Biodiversity of Insects July 2022

TRAKYA UNIVERSITY JOURNAL OF NATURAL SCIENCES

TUJNS

SPECIAL ISSUE: BIODIVERSITY OF INSECTS

Guest Editor: Prof. Dr. Errol HASSAN

Trakya Univ J Nat Sci

ISSN 2528-9691

Trakya University
Journal of Natural Sciences

Volume: 23 Special Issue July 2022
Biodiversity of Insects

Trakya Univ J Nat Sci

http://dergipark.org.tr/trkjnat
e-mail: tujns@trakya.edu.tr

ISSN 2528-9691

ISSN 2528-9691

Trakya University Journal of Natural Sciences
http://dergipark.org.tr/trkjnat
Volume 23 (Special Issue), July 2022

Owner

On behalf of Trakya University Rectorship, Graduate School of Natural and Applied Sciences
Prof. Dr. Hüseyin Rıza Ferhat KARABULUT

Editor-in-Chief
Prof. Dr. Kadri KIRAN

Guest Editor
Prof. Dr. Errol HASSAN

Correspondence Address
Trakya Üniversitesi Fen Bilimleri Enstitüsü Binası, Balkan Yerleşkesi – 22030 Edirne / TÜRKİYE
e-mail: tujns@trakya.edu.tr
Tel: +90 284 2358230
Fax: +90 284 2358237

This Journal is a peer reviewed journal and is indexed by CAB Abstract, CiteFactor, DOAJ (Directory of Open Access Journal), DRJI (Directory of Research Journal Indexing), ESCI (Emerging Sources Citation Index), Google Scholar, ResearchBib, Science Library Index, SIS (Scientific Indexing Services), TUBITAK-ULAKBIM Life Sciences Database (Turkish Journal Index) and Zoological Record.

Publisher
Trakya Üniversitesi Matbaa Tesisleri / Trakya University Publishing Centre

TRAKYA UNIVERSITY JOURNAL OF NATURAL SCIENCES

Volume 23 Special Issue: Biodiversity of Insects July 2022

REVIEWER LIST

ISSN 2528-9691

Trakya University Journal of Natural Sciences
http://dergipark.org.tr/trkjnat
Volume 23 (Special Issue), July 2022

CONTENTS

Orbituary

Research Article

Review

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): 1, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1146149

Obituary
Special Issue: Biodiversity of Insects

UNFORTUNE LOOSE OF ENTOMOLOGY

Hüseyin BAŞPINAR

Aydın Adnan Menderes University, Agriculture Faculty, Plant Protection Department, Aydın, TÜRKİYE

Cite this article as:
Başpınar, H. 2022. Unfortune loose of entomology. *Trakya Univ J Nat Sci*, 23(Special Issue): 1, DOI: 10.23902/trkjnat.1146149

Received: 20 July 2022, Published: 20 July 2022

Professor (Associated) Errol Hassan was born in 1935 in Kukla Village of Baf town in Cyprus. After his Primary and Secondary education in Cyprus, he graduated from Agricultural Faculty of Ankara University in 1960. He completed his PhD. thesis on Forestry Entomology with the highest academic achievement, Magna Cum Laude at George-August University, Germany, in 1966. He worked as Adjunct Associate Professor in The University of Queensland, Gatton Campus, Australia since 1973. Professor Hassan retired in 2000 when in Queensland University. He was asked to continue to give lectures in the university with Honorary degree. He provided many lectures to undergraduate and postgraduate students, supervised thesis of many M.S. and Ph.D. candidates. He was also doing consulting at both national and international levels and was developing training workshops in applied entomology.

He published many articles on Plant Extracts, Essential Oils, Biopesticides, and Integrated Pest Management, and received 608 citations. Professor Hassan named a parasitoid species new for science with the name of his wife in memory of their marriage for more than 50 years.

He had a good relationship with Turkish colleagues, and contributed many of them with his scientific experience.

He passed peacefully on June 27, 2022. He touched the lives of so many people in Turkey, and will be remembered forever.

Editor-in-Chief note: Professor Errol Hassan started to contribute to Editorial Board of Trakya University Journal of Natural Sciences since 13 November 2017 in the fields of Entomology and Agriculture. He read all submitted manuscripts in these fields with an incredible devotion and without a sign of offence, and provided criticisms to improve all. When we made a contact with Professor Errol Hassan to propose him to become the guest editor of the special issue of "Biodiversity of Insects", he replied in the affirmative with a kind manner. He continued to contribute all submissions both in the Editorial Board of the journal and as the guest editor role of the special issue until May 2022. Upon his sickness and the hospitalization process, Prof. Dr. Kadri KIRAN, as the editor-in-chief of the journal, undertook all assigned work load of him and did his best to continue in the scientific line Professor Errol Hassan adopted.

We will never forget advices, contributions on the published manuscripts and academic politeness of Professor Errol Hassan, all which he never conceded with the aim of improving the scientific quality of the journal.

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S3-S8, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1082308

Research Article
Special Issue: Biodiversity of Insects

MORPHOLOGICAL CHARACTERISTICS OF TWO *Culicoides* Latreille BITING MIDGES (DIPTERA, CERATOPOGONIDAE) WITH A NEW RECORD FOR TURKISH FAUNA

Fethi TURGUT

Environmental Health Program. Department of Medical Services and Techniques. Vocational School of Health Services, Sinop University, Sinop, TÜRKİYE
e-mail: fturgut@sinop.edu.tr, ORCID ID: orcid.org/0000-0001-8107-9440

Cite this article as:

Turgut F. 2022. Morphological characteristics of two *Culicoides* Latreille biting midges (Diptera, Ceratopogonidae) with a new record for Turkish fauna. *Trakya Univ J Nat Sci*, 23(Special Issue): S3-S8, DOI: 10.23902/trkjnat.1082308

Received: 03 March 2022, Accepted: 24 May 2022, Online First: 28 June 2022, Published: 20 July 2022

Edited by:
Errol Hassan

Key words:
Biodiversity
Culicoides clastrieri
Lake Sarıkum
Sinop

Abstract: This study was carried out in May-October 2013 and May-November 2017 in Sinop Province (Western Black Sea Region-Turkey). The *Culicoides* Latreille biting midges were collected with light traps and mounted on microscope slides in phenol-Canada balsam. The basic morphological features of *Culicoides clastrieri* Callot, Kremer & Deduit, 1962 and *Culicoides tbilisicus* Dzhafarov, 1964 in Sinop (Turkey) province were studied. *Culicoides clastrieri* is recorded for the first time from Turkey. Thus, the number of *Culicoides* species in Turkey reached to 72. In addition, the first taxonomic measurements and data of males and females of the poorly-known *C. tbilisicus*, whose distribution in Turkey was reported recently, were evaluated.

Özet: Bu çalışma, 2013 yılının Mayıs-Ekim ve 2017 yılının Mayıs-Kasım ayları arasında Sinop ilinde (Batı Karadeniz Bölgesi-Türkiye) gerçekleştirilmiştir. *Culicoides* Latreille cinsine ait sinekler ışık tuzakları ile toplanmış ve fenol-Kanada balzamı içinde mikroskop lamlarına yerleştirilerek prepatları hazırlanmıştır. Sinop (Türkiye) ilinde tespit edilen *Culicoides clastrieri* Callot, Kremer & Deduit, 1962 ve *Culicoides tbilisicus* Dzhafarov, 1964 türlerinin temel morfolojik özellikleri çalışılmıştır. *Culicoides clastrieri* türü Türkiye için yeni kayıttır. Böylece Türkiye *Culicoides* faunasından bildirilen tür sayısı 72'ye ulaşmaktadır. Türkiye'deki yayılışı tespit edilen ve az bilinen *C. tbilisicus* türünün erkek ve dişilerine ait ilk taksonomik ölçümler ve veriler paylaşılmıştır.

Introduction

Flies belonging to the genus *Culicoides* Latreille of the Ceratopogonidae family, known as biting midges, are distributed in all terrestrial habitats of the world reaching to the mountain tops at an altitude of approximately 4.000 m above sea level except the extreme polar regions and New Zealand. They are particularly widespread in temperate and tropical regions (Mellor *et al.* 2000, Borkent 2017).

Biting midges are found along rivers and lakes, in areas with rich vegetation, and near animal shelters. During the day, they hide in trees, shrubs, barns, and rocky places (Dik 2017). Most species are active in the twilight of the morning and evening and at night. During their activity periods, female biting midges take nourishment by sucking blood from their hosts including livestock such as cattle, sheep, goats, horses, donkeys, poultry; domestic animals such as cats, dogs; and humans (Mellor *et al.* 2000, Mullen 2002, Santiago-Alarcon *et al.* 2012, Hadj-Henni *et al.* 2015, Slama *et al.* 2015). Birds, rodents (*Mus musculus* L., *Mustela nivalis* L.), reptiles (*Carlia fusca* Duméril & Bibron), and even *Aedes* spp. and *Drosophila melanogaster* Meigen have also been established to be among the hosts of *Culicoides* (Slama *et al.* 2015). Their bites, despite their small body, are painful and can cause burning and itchiness in humans (Borkent & Spinelli 2007, Borkent 2017). They also act as vectors for many viruses, filarial nematodes and protozoa. Thus, they cause livestock, particularly cattle, sheep, goats, horses to develop sickness and therefore lead to economic losses (Dik *et al.* 2006, Dik 2017).

The distribution of 117 *Culicoides* species in Europe is known currently (Borkent *et al.* 2022). The genus is widespread in Turkey and represented by 71 species (Korkmaz *et al.* 2021), of which 50 species have been reported from the Black Sea Region of the country (Dik *et al.* 2008, Turgut & Kılıç 2015, Dik *et al.* 2017, Turgut 2018a, 2018b, Korkmaz *et al.* 2021, Turgut & Küçük

2022). Recent studies show that, apart from the reported species, the distribution of many biting midges species in Turkey is highly probable. Therefore, with this study, it is aimed to determine these species and to reveal their morphological characteristics.

Materials and Methods

The specimens were collected from Sarıkum Nature Reserve Area in Sinop Province (Western Black Sea Region-Turkey) during the periods from May to October 2013 and May to November 2017 using a Centers for Disease Control (CDC) miniature light trap with 6 V halogen bulb and an 18 W, 12 V black fluorescent light trap. Collected insects were preserved in 70% ethanol. Sampling studies were carried out every 10-15 days. A total of 101 specimens of *Culicoides clastrieri* Callot, Kremer & Deduit, 1962 and *C. tbilisicus* Dzhafarov, 1964 species were mounted on microscope slides in phenol-Canada balsam as described by Wirth & Marston (1968). Specimens were randomly selected to represent each field study. The slides were examined and photographed through a LEICA, DFC 450C & DM 2500 microscope. Species identification was achieved using the interactive species identification key developed by Mathieu *et al.* (2012). Taxonomic measurements were calculated according to Navai (1977) and Szadziewski (1988): Palpal Ratio (PR): ratio of the length of the third segment of the maxillary palp to its widest; Female Antennal Ratio (AR): the ratio of the total length of the distal five flagellomeres to the total length of eight proximal flagellomeres; Male Antennal Ratio (AR): the ratio of the total length of the distal four flagellomeres to the total length of the nine proximal flagellomeres; Costal Ratio (CR): the ratio of costal vein length to wing length (the costal vein length and wing length were measured starting from the basal arculus); Tarsal Ratio (TR): it is calculated by dividing the length of the first tarsomere (basitarsus) by the length of the second tarsomere; TR(I) for forelegs, TR(II) for middle legs and TR(III) hind legs. Materials were deposited in the Sinop University, Vocational School of Health Services, Department of Medical Services and Techniques, Sinop, Turkey.

Results

Systematics

Family CERATOPOGONIDAE Newman

Subfamily Ceratopogoninae Newman

Tribe Culicoidini Kieffer

Genus *Culicoides* Latreille

Subgenus *Sensiculicoides* Shevchenko

Culicoides clastrieri Callot, Kremer & Deduit, 1962

Material examined: Sinop, Centrum, Sarıkum Nature Reserve Area (42.012776 N, 34.929193 E), sea level, 28.06.2017, 1♀.

Distribution

Bosnia and Herzegovina, Britain I., Corsica, French mainland, Germany, Italian mainland, Poland, Slovakia, Slovenia, Spanish mainland, Ukraine (Szadziewski 1985, Sarvašová *et al.* 2014, Borkent & Dominiak 2020, Borkent *et al.* 2022). Gutsevich (1973) and Glukhova (1989) reported this species from Transcarpathian region (Mukachevo) and Remm (1988) reported from France, Yugoslavia, Carpathians. New record for Turkey.

Description

Female (n=1): Eyes bare and separated by a distance less than 1 facet (Fig. 1a). Palpus 5-segmented and 208 µm in length. Third palpal segment moderately swollen, with a broad and shallow sensory pit (Fig. 1b, c). PR 2.57. Pharynx posterior armature present (Fig. 1d). Flagellum length 675 µm. AR 1.38. Sensilla coeloconica present on flagellomeres 1, 7-13 and 1, 8-13.

Thorax and legs yellowish brown, halters pale (Fig. 1e). Tibial comb with 4 spines, the first and the second from the spur the longest. TR (I) 2.5, TR (II) 3, TR (III) 2.1.

Wings with prominent pale spots (Figs. 1f, g). Wing length 1201 µm, width 567 µm. CR 0.6. A large pale spot over the r-m crossvein extending from costal margin to m cell. Second radial cell wholly dark. Poststigmatic pale spot that distal to the second radial cell extends to M1 vein and touch the pale spot on M1 vein. Pale spots merge with wing margin at the apex of the r3, m1, m2 and cua1 cells. It is the largest in cell r3 and extends along the wing margin. Also, a rounded small pale spot in the base of m1 cell. A pale spot in m cell elongates to m2 cell but does not touch with pale spot over the r-m vein; m cell with indistinctly rounded a small pale spot at the base. Anal cell with fused two pale spots. Wing has pale spots over the basal arculus and at the base of anal cell.

Two functional spermathecae, spherical and with short sclerotized necks. Rudimentary spermatheca present. Functional spermathecae 39 × 36 µm and 38 × 32 µm (The posture of the first is not smooth). Sclerotized ring at the end of the spermathecal duct present (Fig. 1h).

Subgenus *Oecacta* Poey

Culicoides tbilisicus Dzhafarov, 1964

Material examined: Sinop, Centrum, Sarıkum Nature Reserve Area (42.012776 N, 34.929193 E), sea level, 16.05.2013, 121♀♀; 24.05.2013, 117♀♀, 2♂♂; 04.06.2013, 12♀♀; 19.06.2013, 39♀♀; 26.06.2013, 3♀♀; 31.05.2017, 1♀; 14.06.2017, 7♀♀; 28.06.2017, 21♀♀; 12.07.2017, 4♀♀; 21.07.2017, 3♀♀.

Distribution in Turkey: Kastamonu, Sinop, Van (Korkmaz *et al.* 2021).

General Distribution: Azerbaijan, Britain I., Bulgaria, China (Tibet), Corsica, French mainland, Georgia, Italian mainland, Near East (Remm 1988, Borkent & Dominiak 2020, Borkent *et al.* 2022). Glukhova (1989) reported this species from the Transcaucasia (Aras River Valley, Tbilisi surroundings, Abkhazia) in the former USSR.

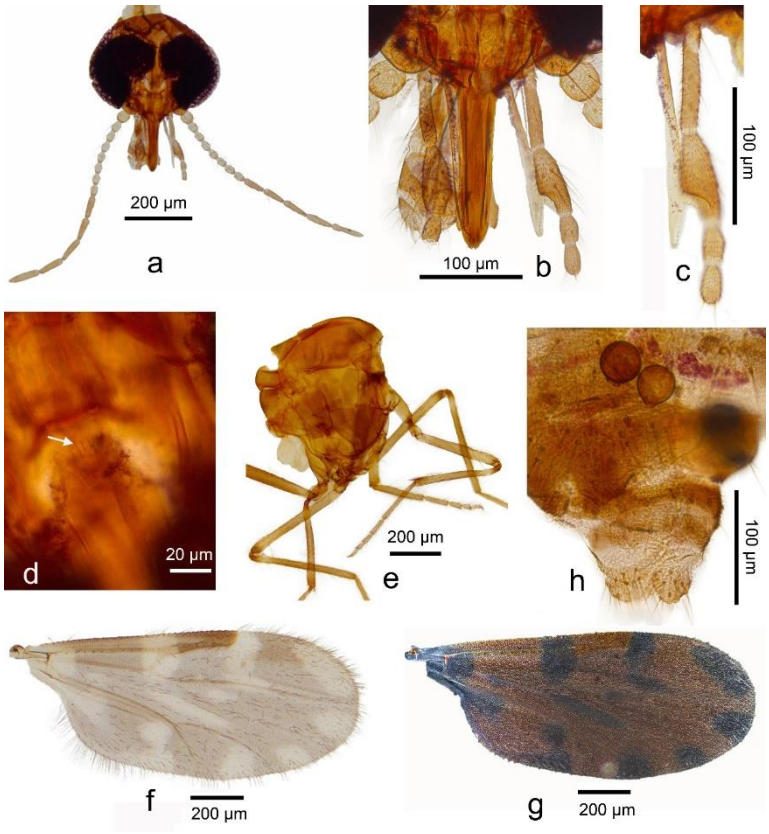

Fig. 1. *Culicoides clastrieri* female. **a**. Head, **b**. mouthparts, **c**. maxillary palp, **d**. pharynx posterior armature, **e**. thorax, **f**. wing (bright field image), **g**. wing (dark field image), **h**. abdomen.

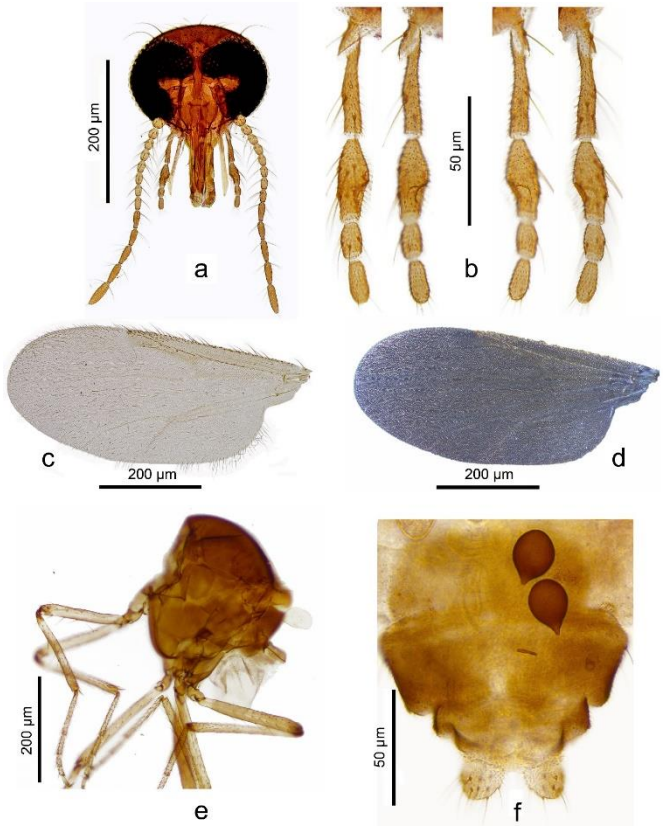

Fig. 2. *Culicoides tbilisicus* female. **a**. Head, **b**. maxillary palps (viewed from different angles), **c**. wing (bright field image), **d**. wing (dark field image), **e**. thorax, **f**. abdomen.

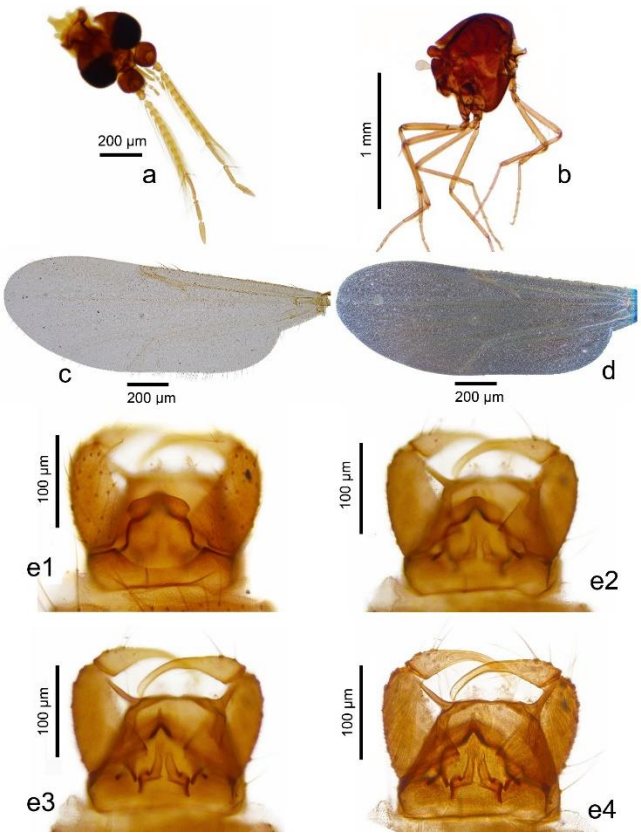

Fig. 3. *Culicoides tbilisicus* male. **a**. Head, **b**. thorax, **c**. wing (bright field image), **d**. wing (dark field image), **e**. genitalia (viewed from different angles).

Description

Female (n=10): Eyes bare and separated by a distance less than a facet (Fig. 2a). Palpus 5-segmented and 117 µm in length (104-124 µm). Third palpal segment moderately swollen, with multiple irregular pits (Fig. 2b). PR 2.61 (2.36-3.06). Flagellum length 314 µm (259-333 µm). AR 1.10 (1.06-1.14). Sensilla coeloconica present on flagellomeres 1, 9-13. In some specimens, sensilla coeloconica were observed on the 8th flagellomere. Sensilla coeloconica are small, light colored and difficult to see.

Wings without markings (Figs. 2c, d), length and width 612 × 288 µm (524-660 × 255-312 µm). CR 0.59 (0.57-0.61). Thorax brown, halters pale and legs light brown (Fig. 2e). Tibial comb with 4 spines, the second from the spur the longest. TR (I) 2.17 (2.07-2.28), TR (II) 2.68 (2.52-3.06), TR (III) 1.98 (1.91-2.06).

Two functional spermathecae, equal, ovoid and with short, sclerotized necks. Rudimentary spermatheca present. Functional spermathecae length and width 27 × 19 µm (25-30 × 17-21 µm), 26 × 19 µm (24-29 × 17-21 µm). Sclerotized ring at the end of the spermathecal duct absent (Fig. 2f).

Male (n=1): Head as in Fig. 3a. Palpus 5-segmented and 215 µm in length (n=2). Third palpal segment slightly swollen and with small sensory pit. PR 3.85 (3.69-4.02; n=2). Flagellum with 13 flagellomeres, length 859 µm (n=1). AR 0.94 (n=1). Flagellomeres 1-10 with long setae and flagellomeres 2-10 fused. Sensilla coeloconica present on flagellomeres 1, 11-13.

Thorax brown and legs yellowish brown (Fig. 3b). Tibial comb with 4 spines, the second from spur longest. TR (I) 2.02 (1.98-2.05; n=2), TR (II) 2.51 (2.43-2.58; n=2), TR (III) 1.87 (1.82-1.92; n=2). Wing without markings (Figs. 3c, d). In one example, wing width and length 1402 × 516 µm, while in the other example 1351 × 511 µm. CR 0.55 (n=2).

Male genitalia as in Fig. 3e. Sternite 9 with a deep and wide caudomedian excavation, membrane without spicules. Apicolateral processes of Tergite 9 long, slender and divergent. Dorsal apodeme of gonocoxite long but ventral apodeme small. Gonostylus curving with slender. Gonostylus broad basally, tapering and curving in the middle and a pointed tip. Parameres separate. Base of parameres bent laterally. Basal knobs large and sclerotized their extensions elongate parallel anteriorly. Also, protrusions in the form of thorns facing each other on the base of the parameres. Stem of parameres moderatly stout, apically swollen. Parameres with 4-5 pointed extensions laterally at the apex. Aedeagus with a very deep, broad, sclerotized basal arch with a pointed tip posteriorly. Lateral arms slender and curved, directed laterally at base. Shoulders of aedeagus remarkably broad and swollen. Distal median process long and slender, tapering to a rounded apex.

Discussion

Culicoides clastrieri is recorded for the first time from Turkey. Addition of this species in the fauna increased the reported number of *Culicoides* species in Turkey to 72. In addition, the number of *Culicoides* biting midges detected in Sinop is 30 (Dik *et al.* 2008, Turgut & Kılıç 2015, Dik *et al.* 2017, Turgut 2018a, 2018b, Korkmaz *et al.* 2021, Turgut & Küçük 2022). The distribution of *C. alazanicus* Dzhafarov, 1961, *C. delta* Edwards, 1939 (as *C. deltus*) (Dik *et al.* 2017), *C. brunnicans* Edwards, 1939, *C. griseidorsum* Kieffer, 1918 (Turgut & Kılıç 2015), *C. chiopterus* (Meigen, 1830), *C. comosioculatus* Tokunaga, 1956, *C. haranti* Rioux, Descous & Pech, 1959 has been reported only from the Black Sea Region in Turkey. Thus, *C. clastrieri* was included in these seven species.

Culicoides clastrieri is similar to *C. festivipennis* Kieffer, 1914 in terms of morphology. As a result of recent molecular studies, it has been revealed that these two species are also genetically close to each other (Sarvašová *et al.* 2014). However, due to the differences in their morphology, ecology, and trophic preferences, the opinion that these two species should be considered as different species has gained acceptance (Sarvašová *et al.* 2014). One of the main morphological differences between the two species is the dispersion of sensilla coeloconica in their antennae. In *C. clastrieri*, sensilla coeloconica are found in flagellomeres 1, 9-13, while in *C. festivipennis*, it is found in flagellomeres 1-13 (Mathieu *et al.* 2012; Sarvašová *et al.* 2014). In the specimen examined in this study, sensilla coeloconica were detected in flagellomeres 1, 7-13 on one antenna, and in flagellomeres 1, 8-13 on the other antenna, demonstrating the variation of the species in terms of the dispersion of sensilla coeloconica. A similar example of variation was noted by Szadziewski (1985). He reported that there were sensilla coeloconica on the flagellomere 3 in one antenna and on the flagellomere 4 in the other antenna in a specimen he examined. Another important morphological difference between the two species is seen in wing patterning. In *C. clastrieri*, the pale spot in the cell r5 is large and extends towards the second radial cell. However, the pale spot in the r5 cell in *C. festivipennis* is small. In addition, *C. festivipennis* contains 2-3 separate pale spots in m cells. But in *C. clastrieri*, the m cell has a large pale spot that does not merge with the pale spot on the r-m vein and extends towards the m2 cell (Figs. 1f, g) (Mathieu *et al.* 2012).

Culicoides tbilisicus is morphologically similar to *C. furcillatus* Callot, Kremer & Paradis, 1962. However, they differ in wing patterning and sensory pit structure in their third palpal segment. There are two pale spots on *C. furcillatus* wing and there is a small shallow sensory pit on its third palpal segment. However, the wing of *C. tbilisicus* is unpatterned (Figs. 2c, d) and carries multiple irregular sensory pits in its third palpal segment (Fig. 2b) (Mathieu *et al.* 2012). *Culicoides tbilisicus* bears sensilla coeloconica on flagellomeres 1, 9-13. It has been detected that the majority of the examined *C. tbilisicus* specimens have this sensilla coeloconica dispersion. Yet, in some specimens, it was observed that there was sensilla coeloconica on the flagellomeres 2, 3, 4, 7 and 8. Similarly, Glukhova (1989) reported that *C. tbilisicus* carries sensilla coeloconica on flagellomeres 1, 5-13 or 6-13.

As a result of the recent faunistic studies on biting midges in Turkey, important contributions have been made to the fauna of *Culicoides*. The number of species, which reached to 72 with the addition of *C. clastrieri* to the Turkish biting midges fauna is relatively high when compared to the 117 species in Europe. This situation reveals once again the importance of Turkey in terms of biodiversity.

Acknowledgement

I would like to thank Prof. Dr. Bilal DİK from Selçuk University (Türkiye) and Prof. Dr. Ryszard SZADZIEWSKI from the University of Gdansk (Poland) who contributed by sharing their valuable ideas on the manuscript. I would like to express my gratitude to Forest Engineer Mr. Şaban KÜÇÜK from the Sinop Regional Directorate of Forestry for his support (Türkiye).

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Conflict of Interest: The author has no conflicts of interest to declare.

Funding: The study was supported by the Sinop University Scientific Research Projects Coordination Unit with project number SHMYO-1901-16-23.

References

1. Borkent, A. & Spinelli, G.R. 2007. Neotropical Ceratopogonidae (Diptera: Insecta). pp 1-198. In: Adis, J., Arias, J.R., Rueda-Delgado, G. & Wnatzen K.M. (eds). *Aquatic Biodiversity in Latin America (ABLA)*. Vol. 4. Pensoft, Sofia-Moscow, 198 pp.
2. Borkent, A. 2017. Ceratopogonidae (biting midges). pp. 733-812. In: Kirk-Spriggs, A.H & Sinclair B.J. (eds). *Manual of Afrotropical Diptera*, Vol. 2. Nematocerous Diptera and lower Brachycera. Suricata 5. Pretoria, South African National Biodiversity Institute, 935 pp.
3. Borkent, A. & Dominiak, P. 2020. Catalog of the biting midges of the world (Diptera: Ceratopogonidae). *Zootaxa*, 4787(1): 1-377. https://doi.org/10.11646/zootaxa.4787.1.1
4. Borkent, A., Dominiak, P. & Szadziewski, R. 2022. Fauna Europaea: Ceratopogonidae. In: Beuk, P. & Pape, T. (eds). *Fauna Europeae: Diptera Nematocera*. Fauna Europaea Version 2.6.2. https://fauna-eu.org/ (Date accessed: 01.03.2022).
5. Dik, B., Yağcı, Ş. & Linton, Y.M. 2006. A review of species diversity and distribution of *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) in Turkey. *Journal of*

Natural History, 40(32-34): 1947-1967. https://doi.org/10.1080/00222930601046634

6. Dik, B., Kurt, M. & Aydın, İ. 2008. A study on *Culicoides* (Diptera: Ceratopogonidae) species in Black Sea Region in Turkey. *Bornova Veteriner Kontrol Araştırma Enstitüsü Dergisi*, 30 (44): 23-26.

7. Dik, B. 2017. *Culicoides* (Diptera: Ceratopogonidae) Vektörlükleri ve Mücadelesi. pp. 47-109. In: Özbel Y. (ed). *Vektör Artropodlar ve Mücadelesi*. Yayın No: 25. Türkiye Parazitoloji Derneği, İzmir, 521 pp.

8. Dik, B., Kuçlu, Ö. & Öztürk, R. 2017. *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) species in the Western Black Sea Region of Turkey, new records for the Turkish fauna. *Turkish Journal of Veterinary and Animal Sciences*, 41(2): 228-237. https://doi.org/10.3906/vet-1606-41

9. Glukhova, V.M. 1989. *Blood-sucking midges of the genera Culicoides and Forcipomyia (Ceratopogonidae).* Fauna of the USSR, 139, Vol. 3 (5a). Nauka, Leningrad, 408 pp.

10. Gutsevich, A.V. 1973. *The bloodsucking midges (Ceratopogonidae). Fauna SSSR. Dipterous Insects*, III, 5, Nauka, Leningrad, 270 pp.

11. Hadj-Henni, L., De Meulemeester, T., Depaquit, J., Noël, P., Germain, A., Helder, R. & Augot, D. 2015. Comparison of vertebrate cytochrome b and prepronociceptin for blood meal analyses in *Culicoides*. *Frontiers in Veterinary Science*, 2, 15. https://doi.org/10.3389/fvets.2015.00015

12. Korkmaz, C., Alten, B., Erol, U. & Deniz, A. 2021. Updated checklist of *Culicoides* Latreille (Diptera: Ceratopogonidae) of Turkey with ten new records. *Journal of Vector Ecology*, 46(2): 124-136.

13. Mathieu, B., Cêtre-Sossah, C., Garros, C., Chavernac, D., Balenghien, T., Carpenter, S., Setier-Rio, M.L., Vignes-Lebbe, R., Ung, V., Candolfi, E. & Delécolle J.C. 2012. Development and validation of IIKC: an interactive identification key for *Culicoides* (Diptera: Ceratopogonidae) females from the Western Palaearctic region. *Parasites & Vectors*, 5, 137. https://doi.org/10.1186/1756-3305-5-137

14. Mellor, P.S., Boorman, J. & Baylis, M. 2000. *Culicoides* biting midges: their role as arbovirus vectors. *Annual Review of Entomology*, 45(1): 307-340. https://doi.org/10.1146/annurev.ento.45.1.307

15. Mullen, G.R. 2002. Biting Midges (Ceratopogonidae). pp. 163-183. In: Mullen G.R. & Durden L. (eds). *Medical and Veterinary Entomology*. Academic Press, San Diego, CA, xv + 597.

16. Navai, S. 1977. *Biting-midges of the genus Culicoides (Diptera: Ceratopogonidae) from Southwest Asia*. Ph.D. Thesis, University of Maryland, 202 pp.

17. Remm, H. 1988. Family Ceratopogonidae. pp. 11-110. In: Soos, A. & Papp, L. (eds). *Catalogue of Palaearctic Diptera*, Volume 3, Ceratopogonidae-Mycetophilidae. Akademiai Ciado, Budapest, 448 pp.

18. Santiago-Alarcon, D., Havelka, P., Schaefer, H.M. & Segelbacher, G. 2012. Bloodmeal analysis reveals avian *Plasmodium* infections and broad host preferences of *Culicoides* (Diptera: Ceratopogonidae) vectors. *PLoS One*, 7:2:e31098. https://doi.org/10.1371/journal.pone.0031098

19. Sarvašová, A., Kočišová, A., Halán, M., Delécolle, J-C. & Mathieu, B. 2014. Morphological and molecular analysis of the genus *Culicoides* (Diptera: Ceratopogonidae) in Slovakia with five new records. *Zootaxa*, 3872(5): 541-560. https://doi.org/10.11646/zootaxa.3872.5.6

20. Slama, D., Haouas, N., Mezhoud, H., Babba, H. & Chaker, E. 2015. Blood meal analysis of *Culicoides* (Diptera: Ceratopogonidae) in central Tunisia. *PLoS One*, 10(3):e0120528. https://doi.org/10.1371/journal.pone.0120528

21. Szadziewski, R. 1985. A faunistic review of the Polish biting midges of the genus *Culicoides* (Diptera, Ceratopogonidae). *Polskie Pismo Entomologiczne*, 55(2): 283-341.

22. Szadziewski, R. 1988. Biting midges (Diptera, Ceratopogonidae) from Baltic amber. *Polskie Pismo Entomologiczne*, 57(1): 3-283.

23. Turgut, F. & Kılıç, A.Y. 2015. The Ceratopogonidae (Insecta: Diptera) fauna of the Central Black Sea Region in Turkey. *Turkish Journal of Zoology*, 39(6): 1071-1089. https://doi.org/10.3906/zoo-1410-33

24. Turgut, F. 2018a. Contributions to *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) fauna of Sinop Province. *Sakarya University Journal of Science*, 22(6): 1683-1693. https://doi.org/10.16984/saufenbilder.366696

25. Turgut, F. 2018b. Contributions to *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) fauna of Samsun Province. *Gaziosmanpasa Journal of Scientific Research*, 7(2): 14-20.

26. Turgut, F. & Küçük, Ş. 2022. *Culicoides* biting midges (Diptera: Ceratopogonidae) of Sarıkum Nature Reserve Area (Sinop-Turkey). Munis Entomology & Zoology, 17(1): 286-300.

27. Wirth, W.W. & Marston, N. 1968. A method for mounting small insects on microscope slide in Canada Balsam. *Annals of the Entomological Society of America*, 61(3): 783-784. https://doi.org/10.1093/aesa/61.3.783

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S9-S22, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1110724

Research Article
Special Issue: Biodiversity of Insects

ALIEN APHIDS (HEMIPTERA: APHIDOMORPHA) OF TÜRKİYE

Şahin KÖK[1]*, Işıl ÖZDEMİR[2]

[1] Çanakkale Onsekiz Mart University, Lâpseki Vocational School, Department of Plant and Animal Production, 17800, Çanakkale, TÜRKİYE
[2] Plant Protection Central Research Institute, 06172, Ankara, TÜRKİYE

Cite this article as:
Kök Ş. & Özdemir I. 2022. Alien aphids (Hemiptera: Aphidomorpha) of Türkiye. *Trakya Univ J Nat Sci*, 23(Special Issue): S9-S22, DOI: 10.23902/trkjnat.1110724

Received: 28 April 2022, Accepted: 03 July 2022, Online First: 14 July 2022, Published: 20 July 2022

Edited by:
Kadri KIRAN

Corresponding Author:
Şahin Kök
sahinkok@gmail.com

ORCID iDs of the authors:
ŞK. orcid.org/0000-0002-1092-8596
IÖ. orcid.org/0000-0001-9542-7442

Key words:
Non-native
Aphididae
Distribution
Origin

Abstract: This study aims to show results of a prospective study on the relationship and the variation between the number of aphid species and the number of alien aphid species in Türkiye, the taxonomic diversity of alien aphids, their distribution in Türkiye and the regions of origin of alien aphids. The study showed the presence of 57 alien aphid species belonging to 32 genera from the Aphidomorpha infraorder (Hemiptera) recorded in Türkiye between 1903 and 2021. It was shown that the alien aphid constitute about 10% of the aphid fauna of Türkiye including 592 species belonging to 148 genera. Based on 119 years of data, the average introduction rate of alien aphids into the aphid fauna of Türkiye was calculated as 0.48 species per year. It was shown that the alien aphids are found in 60 to 81 different provinces in Türkiye. We conclude that more local and territorial studies should be carried out in order to evaluate details of the current status and distribution of alien aphids in Türkiye.

Özet: Bu çalışma Türkiye'deki afit ve yabancı afit türlerinin sayıları arasındaki ilişki ve değişim, yabancı afitlerin taksonomik çeşitliliği, Türkiye'deki dağılımı ve orijin bölgeleri üzerine önemli sonuçları göstermeyi amaçlamaktadır. Bu kapsamlı çalışma 1903 ve 2021 yılları arasında Türkiye'de kayıt edilen Aphidomorpha alttakımından (Hemiptera) 32 cinse ait 57 yabancı afit türünün varlığını ortaya koymaktadır. Yabancı afit türlerinin 148 cinse ait 592 türü barındıran Türkiye afit faunasının yaklaşık %10'unu oluşturduğu gösterilmiştir. 119 yıllık verilere dayanarak, yabancı afitlerin Türkiye afit faunasına giriş oranı yıllık 0,48 tür olarak hesaplanmıştır. Ayrıca, yabancı afitlerin Türkiye'nin 81 ilinin 60'ında bulunduğu gösterilmiştir. Sonuç olarak, Türkiye'de yabancı afitlerin güncel statüleri ve dağılımlarının detaylı olarak değerlendirilebilmesi için daha fazla bölgesel ve ülkesel çalışmanın yürütülmesi gerektiği düşünülmektedir.

Introduction

Alien species, which are non-native plants, animals, pathogens, and other organisms introduced into a new ecosystem, are one of the major threats to the environment, economy and biodiversity worldwide. In recent years, globalization and climate change have caused the transfer, establishment and reproduction of alien species in different regions of the world. More than 11,000 alien species, including aphids, are distributed throughout the European continent (Hulme *et al.* 2009). A temperature rise of 1.1 - 6.4°C by 2100 due to the emission of greenhouse gases in the world (IPCC 2007) is predicted to cause adverse effects on the biology, ecology and habitats of insects.

In the light of the above predictions, aphids which are highly sensitive to climatic changes have become more important due to their biological features that are rapidly affected by global warming. Aphids are one of the major agricultural pests that damage a large number of cultivated crops and forestry by sucking plant sap and secreting honeydew. They also vector more than 270 phytopathogenic viruses that cause serious economic damage to agricultural crops (Katis *et al.* 2007). These insects are mostly distributed in terrestrial ecosystems worldwide (Jouraeva *et al.* 2006, van Emden & Harrington 2007, Alford 2011, Diehl *et al.* 2013). Some biological functions of aphids such as survival, distribution and reproduction are influenced by temperature. Aphids are represented by 5321 extanct species mostly distributed in the temperate regions in the northern hemisphere (Favret 2022) due to the effect of temperature on their geographic distribution. Also, sexual reproduction in some aphid species is affected by temperature and this causes parthenogenetic reproduction to continue throughout the year. Higher temperatures (above 20°C) might delay or even totally prevent sexual

reproduction in some aphids (Blackman 1974). This means the emergence of new generations that reproduce and are active parthenogenetically throughout the year (Hullé *et al.* 2010). In addition, it was reported that there are strong relationships between the phenology of native or alien aphids and environmental variables for many species (Harrington *et al.* 2007).

Considering the effect of climatic factors on the aphids, there is a need for comprehensive detection and evaluation of alien aphids of Türkiye. The first studies on the aphid fauna of Türkiye date back to the beginning of the 20th century (Trotter 1903, Fahringer 1922, Houard 1922). In later years, Çanakçıoğlu (1975), Tuatay (1988, 1990, 1991, 1993, 1999), Remaudière *et al.* (2006), Görür *et al.* (2012), Kök & Özdemir (2021) reviewed and listed aphids of Türkiye including some alien species records. With the latest new records, the aphid fauna of Türkiye has reached 592 species belonging to 148 genera in the Aphidomorpha infraorder (Kök & Özdemir 2021, Oğuzoğlu *et al.* 2021). Also, Akyıldırım *et al.* (2013) revealed some information about the composition of the aphid fauna of Türkiye and the alien species.

Although many studies have been carried out on aphid fauna in different regions of Türkiye, detailed information about alien aphids is still very limited. This study aimed to present a comprehensive list of alien aphids and to show the alienness of aphid species recorded between 1903 and 2021 for the fauna of Türkiye.

Materials and Methods

The data on aphids used in this study is based on published papers of aphid and alien aphid species recorded in Türkiye between 1903 and 2021. The publications were obtained by searching Web of Science, Google Scholar and Google. Current taxonomic status and nomenclature of aphid species in "Aphids on the World's Plants. An Online Identification and Information Guide (http://www.aphidsonworldsplants.info)" (Blackman & Eastop 2022) and "The Aphid Species File (http://www.Aphid. SpeciesFile.org)" were followed (Favret 2022).

To determine the alien status of the aphid species, Coeur d'acier *et al.* (2010), Görür *et al.* (2012), Wieczorek (2011), Kök & Özdemir (2021), Oğuzoğlu *et al.* (2021), Blackman & Eastop (2022) were used. To reveal the relationship between the number of aphid species and alien aphid species in Türkiye between 1903 and 2021, Spearman's correlation test was applied by using Minitab 17.

Results

The results of our study revealed the presence of 57 alien aphid species belonging to 32 genera from the Aphidomorpha infraorder (Hemiptera) recorded in Türkiye between 1903 and 2021. The comprehensive checklist including the alien aphid species sorted by taxonomic order, their distribution in Türkiye and the origin regions is presented below.

Order HEMIPTERA Linnaeus

Suborder Sternorrhyncha Amyot & Serville

Infraorder Aphidomorpha Bekker-Migdisova & Aizenberg

Superfamily Adelgoidea Schouteden

Family Adelgidae Schouteden

Genus *Adelges* Vallot

Subgenus *Gilletteella* Börner

Adelges (*Gilletteella*) *cooleyi* (Gillette, 1907)

Distribution in Türkiye: Artvin, Rize (Görür *et al.* 2009a).

Origin region: North America.

Superfamily Aphidoidea Latreille

Family Aphididae Latreille

Subfamily Aphidinae Latreille

Tribe Aphidini Latreille

Subtribe Aphidina Latreille

Genus *Aphis* Linnaeus

Subgenus *Aphis* Linnaeus

Aphis (*Aphis*) *asclepiadis* Fitch, 1851

Distribution in Türkiye: Samsun (Akyürek *et al.* 2010), Artvin, Trabzon (Görür *et al.* 2009b), Yalova (Kuloğlu & Özder 2017), Erzurum (Başer & Tozlu 2020).

Origin region: North America.

Aphis (*Aphis*) *forbesi* Weed, 1889

Distribution in Türkiye: İzmir (Tuatay 1993), Mersin (Toros *et al.* 2002), Bursa (Kovancı *et al.* 2004).

Origin region: North America.

Aphis (*Aphis*) *illinoisensis* Shimer, 1866

Distribution in Türkiye: Adana, Hatay, Kilis (Remaudière *et al.* 2003), Niğde (Görür 2004a), İzmir (Eser *et al.* 2009), Isparta (Barjadze *et al.* 2011a), Mersin (Yanpar 2013), Afyonkarahisar, Kütahya (Görür 2014).

Origin region: North America.

Aphis (*Aphis*) *impatientis* Thomas, 1878

Distribution in Türkiye: Artvin, Trabzon (Görür *et al.* 2009a).

Origin region: North America.

Aphis (*Aphis*) *maculatae* Oestlund, 1887

Distribution in Türkiye: Karabük (Tepecik *et al.* 2011).

Origin region: North America.

Aphis (*Aphis*) *spiraecola* Patch, 1914

Distribution in Türkiye: Adana (Tuatay & Remaudière 1964), Hatay, Mersin (Toros *et al.* 2002), Diyarbakır (Ölmez Bayhan *et al.* 2003), Niğde (Görür 2004a),

Kahramanmaraş (Aslan & Uygun 2005), Denizli (Çıraklı *et al.* 2008), Bartın (Toper Kaygın *et al.* 2009), İzmir (Eser *et al.* 2009), Samsun (Akyürek *et al.* 2012), Artvin, Trabzon (Akyıldırım *et al.* 2014), Afyonkarahisar, Kütahya, Uşak (Görür 2014), Antalya (Saraç *et al.* 2015), Erzincan (Alaserhat 2015), Aydın (Yerlikaya *et al.* 2016), Balıkesir, Çanakkale (Kök & Kasap 2019), Erzurum (Başer & Tozlu 2020).

Origin region: East Asia.

Genus *Protaphis* Börner

Protaphis middletonii (Thomas, 1879)

Distribution in Türkiye: Samsun (Akyürek *et al.* 2011), Afyonkarahisar (Görür 2014).

Origin region: North America.

Genus *Siphonatrophia* Swain

Subgenus *Siphonatrophia* Swain

Siphonatrophia (*Siphonatrophia*) *cupressi* (Swain, 1918)

Distribution in Türkiye: Antalya, Burdur, Bilecik, Isparta (Oğuzoğlu *et al.* 2021).

Origin region: North America.

Subtribe *Rhopalosiphina* Mordvilko

Genus *Hysteroneura* Davis

Hysteroneura setariae (Thomas, 1878)

Distribution in Türkiye: Niğde (Görür 2004a), Artvin (Görür *et al.* 2009b), Afyonkarahisar (Görür 2014).

Origin region: North America.

Genus *Melanaphis* van der Goot

Melanaphis bambusae (Fullaway, 1910)

Distribution in Türkiye: Adıyaman (Şenol *et al.* 2017).

Origin region: East Asia.

Melanaphis sacchari (Zehntner, 1897)

Distribution in Türkiye: Adana (Toros *et al.* 2002), Antalya (Güleç 2011).

Origin region: Southeast Asia.

Genus *Rhopalosiphum* Koch

Rhopalosiphum oxyacanthae (Schrank, 1801)

Distribution in Türkiye: Ankara, Bitlis (Tuatay & Remaudière 1964), Denizli (Çıraklı *et al.* 2008), Niğde (Görür 2004b), Bursa, Sakarya (Hantaş *et al.* 2014), Kütahya (Görür 2014).

Origin region: North America.

Rhopalosiphum rufulum Richards, 1960

Distribution in Türkiye: Kütahya (Şenol *et al.* 2015b).

Origin region: North America.

Tribe Macrosiphini Wilson

Genus *Acyrthosiphon* Mordvilko

Subgenus *Acyrthosiphon* Mordvilko

Acyrthosiphon (Acyrthosiphon) *caraganae* Cholodkovsky, 1908

Distribution in Türkiye: Ankara (Düzgüneş *et al.* 1982).

Origin region: Middle Asia.

Acyrthosiphon (*Acyrthosiphon*) *kondoi* Shinji, 1938

Distribution in Türkiye: İstanbul (Akyıldırım *et al.* 2011), Kayseri (Özdemir 2020).

Origin region: East Asia.

Genus *Brachycaudus* van der Goot

Subgenus *Thuleaphis* Hille Ris Lambers

Brachycaudus (*Thuleaphis*) *rumexicolens* (Patch, 1917)

Distribution in Türkiye: Bitlis (Tuatay & Remaudière 1964).

Origin region: North America.

Genus *Cavariella* Del Guercio

Subgenus *Cavariella* Del Guercio

Cavariella (*Cavariella*) *digitata* Hille Ris Lambers, 1969

Distribution in Türkiye: Trabzon (Görür *et al.* 2011a), Afyonkarahisar, Kütahya (Görür 2014).

Origin region: North America.

Genus *Chaetosiphon* Mordvilko

Subgenus *Pentatrichopus* Börner

Chaetosiphon (*Pentatrichopus*) *fragaefolii* (Cockerell, 1901)

Distribution in Türkiye: Ankara (Bodenheimer & Swirski 1957), Aydın, Elazığ, Giresun, Mersin, İzmir, Manisa (Tuatay 1988), Bursa (Kovancı *et al.* 2004).

Origin region: North America.

Genus *Illinoia* Wilson

Subgenus *Masonaphis* Hille Ris Lambers

Illinoia (*Masonaphis*) *lambersi* (MacGillivray, 1960)

Distribution in Türkiye: Rize (Görür *et al.* 2011a).

Origin region: North America.

Genus *Macrosiphoniella* Del Guercio

Subgenus *Macrosiphoniella* Del Guercio

Macrosiphoniella (*Macrosiphoniella*) *sanborni* (Gillette, 1908)

Distribution in Türkiye: Türkiye (Düzgüneş & Tuatay 1956), Ankara (Bodenheimer & Swirski 1957, Özdemir & Toros 1997), Gaziantep, Sakarya (Tuatay *et al.* 1972), İzmir (Giray 1974), Bolu, Eskişehir, Konya, Malatya,

Manisa, Rize, Samsun, Şanlıurfa (Tuatay 1990), Aksaray (Geneci & Görür 2007), Bartın (Toper Kaygın *et al.* 2009), Artvin, Trabzon (Görür *et al.* 2009b), Antalya (Güleç 2011), Adana (Çalışkan 2015), Yalova (Kuloğlu & Özder 2017), Çanakkale (Kök & Kasap 2019).

Origin region: East Asia.

Macrosiphoniella (*Macrosiphoniella*) *tapuskae* (Hottes & Frison, 1931)

Distribution in Türkiye: Ankara, Bitlis, Niğde (Tuatay & Remaudière 1964), Erzurum, Van (Tuatay 1990).

Origin region: North America.

Genus *Macrosiphum* Passerini

Subgenus *Macrosiphum* Passerini

Macrosiphum (*Macrosiphum*) *euphorbiae* (Thomas, 1878)

Distribution in Türkiye: Ankara, İstanbul (Tuatay & Remaudière 1964, Özdemir & Toros 1997), İzmir (Giray 1974), Amasya, Erzurum, Sakarya (Tuatay 1990), Adana, Hatay, Mersin (Toros *et al.* 2002), Konya (Altay & Uysal 2005), Balıkesir (Ayyıldız & Atlıhan 2006), Aksaray (Geneci & Görür 2007), Denizli (Çıraklı *et al.* 2008), Artvin, Rize, Trabzon (Görür *et al.* 2009b), Bartın (Toper Kaygın *et al.* 2009), Antalya (Güleç 2011), Samsun (Akyürek 2013), Afyonkarahisar, Kütahya, Uşak (Görür 2014), Çanakkale (Kök *et al.* 2016), Kay (Öztürk & Muştu 2017), Yalova (Kuloğlu & Özder 2017), Isparta (Bayındır Erol *et al.* 2018).

Origin region: North America.

Macrosiphum (*Macrosiphum*) *impatientis* (Williams, 1911)

Distribution in Türkiye: Samsun (Akyürek 2006), Rize, Trabzon (Görür *et al.* 2009b).

Origin region: North America.

Macrosiphum (*Macrosiphum*) *pachysiphon* Hille Ris Lambers, 1966

Distribution in Türkiye: Kütahya (Şenol *et al.* 2015a).

Origin region: Southeast Asia.

Macrosiphum (*Macrosiphum*) *pallidum* (Oestlund, 1887)

Distribution in Türkiye: Samsun (Akyürek 2006), Rize, Trabzon (Görür *et al.* 2009b).

Origin region: North America.

Genus *Myzus* Passerini

Subgenus *Myzus* Passerini

Myzus (*Myzus*) *varians* Davidson, 1912

Distribution in Türkiye: Adana, Hatay (Toros *et al.* 2002), Samsun (Akyürek 2013), Gümüşhane (Alaserhat 2015).

Origin region: East Asia.

Subgenus *Nectarosiphon* Schoute

Myzus (*Nectarosiphon*) *persicae* (Sulzer, 1776)

Distribution in Türkiye: Türkiye (Alkan 1952), Ankara, İstanbul (Bodenheimer & Swirski 1957, Özdemir & Toros 1997), İzmir (Tuatay *et al.* 1972), Bolu (Çanakçıoğlu 1975), Amasya, Aydın, Balıkesir, Bursa, Çanakkale, Düzce, Eskişehir, Giresun, Mersin, Kocaeli, Konya, Kırklareli, Manisa, Muş, Sakarya, Samsun, Sinop, Tekirdağ, Trabzon, Tokat, Tunceli, Uşak (Tuatay 1991), Adana (Toros *et al.* 2002), Van (Toros *et al.* 1996), Diyarbakır (Ölmez Bayhan *et al.* 2003), Isparta (Aslan & Karaca 2005), Kahramanmaraş (Aslan & Uygun 2005), Malatya (Ölmez Bayhan *et al.* 2006), Aksaray (Geneci & Görür 2007), Artvin, Rize (Görür *et al.* 2009b), Bartın (Toper Kaygın *et al.* 2009), Antalya (Güleç 2011), Afyonkarahisar, Kütahya (Görür 2014), Erzincan, Gümüşhane (Alaserhat 2015), Kayseri (Öztürk & Muştu 2017), Yalova (Kuloğlu & Özder 2017).

Origin region: Cryptogenic.

Genus *Nearctaphis* Shaposhnikov

Nearctaphis bakeri (Cowen, 1895)

Distribution in Türkiye: Adana (Toros *et al.* 2002), Niğde (Görür 2002), Artvin, Rize, Trabzon (Görür *et al.* 2009b), Afyonkarahisar, Kütahya (Görür 2014), Erzurum (Başer & Tozlu 2020).

Origin region: North America.

Genus *Rhodobium* Hille Ris Lambers

Rhodobium porosum (Sanderson, 1900)

Distribution in Türkiye: Isparta (Barjadze *et al.* 2011b), Adana (Çalışkan 2015), Yalova (Kuloğlu & Özder 2017), Çanakkale (Kök & Kasap 2019).

Origin region: Tropical – Subtropical.

Genus *Rhopalosiphoninus* Baker

Subgenus: *Rhopalosiphoninus* Baker

Rhopalosiphoninus (*Rhopalosiphoninus*) *latysiphon* (Davidson, 1912)

Distribution in Türkiye: Sakarya (Tuatay 1991).

Origin region: North America.

Genus *Trichosiphonaphis* Takahashi

Subgenus *Xenomyzus* Aizenberg

Trichosiphonaphis (*Xenomyzus*) *polygonifoliae* Shinji, 1944

Distribution in Türkiye: Ankara (Özdemir *et al.* 2005).

Origin region: East Asia.

Genus *Uroleucon* Mordvilko

Subgenus *Lambersius* Olive

Uroleucon (*Lambersius*) *erigeronense* (Thomas, 1878)

Distribution in Türkiye: Ankara (Düzgüneş *et al.* 1982), Antalya (Güleç 2011).

Origin region: North America.

Uroleucon (*Uroleucon*) *ambrosiae* (Thomas, 1878)

Distribution in Türkiye: Trabzon (Görür *et al.* 2011b), Samsun (Akyürek 2013), Afyonkarahisar, Kütahya (Görür 2014), Erzurum (Başer & Tozlu 2020).

Origin region: North America.

Uroleucon (*Uroleucon*) *pseudambrosiae* (Olive, 1963)

Distribution in Türkiye: Samsun (Akyurek *et al.* 2010).

Origin region: North America.

Subgenus *Uromelan* Mordvilko

Uroleucon (*Uromelan*) *compositae* (Theobald, 1915)

Distribution in Türkiye: Artvin, Trabzon (Görür *et al.* 2011b), Yalova (Kuloğlu & Özder 2017), Erzurum (Başer & Tozlu 2020).

Origin region: Africa.

Genus *Wahlgreniella* Hille Ris Lambers

Wahlgreniella nervata nervata (Gillette, 1908)

Distribution in Türkiye: Denizli (Çıraklı *et al.* 2008), Bartın (Toper Kaygın *et al.* 2008), Artvin, Rize, Trabzon (Görür *et al.* 2009b), İzmir (Eser *et al.* 2009), Samsun (Akyürek *et al.* 2012), Afyonkarahisar (Görür 2014), Isparta (Barjadze *et al.* 2014).

Origin region: North America.

Wahlgreniella nervata arbuti (Davidson, 1910)

Distribution in Türkiye: Burdur, Zonguldak (Tuatay & Remaudière 1964), İzmir (Tuatay 1991), Çanakkale (Kök & Kasap 2019).

Origin region: North America.

Subfamily Calaphidinae Oestlund

Tribe Calaphidini Oestlund

Genus *Neobetulaphis* Basu

Neobetulaphis pusilla Basu, 1964

Distribution in Türkiye: Artvin, Rize, Trabzon (Görür *et al.* 2011a), Samsun (Akyürek 2013).

Origin region: South Asia.

Tribe Myzocallidini Börner

Genus *Myzocallis* Passerini

Subgenus *Lineomyzocallis* Richards

Myzocallis (*Lineomyzocallis*) *walshii* (Monell, 1879)

Distribution in Türkiye: Adana (Çalışkan *et al.* 2012).

Origin region: North America.

Tribe Panaphidini Oestlund

Genus *Monellia* Oestlund

Monellia caryella (Fitch, 1855)

Distribution in Türkiye: Antalya (Özkan & Türkyılmaz 1990), Mersin (Toros *et al.* 2002), Aydın (Kaya Apak & Akşit 2016).

Origin region: North America.

Tribe Therioaphidini Börner

Genus *Tinocallis* Matsumura

Subgenus *Sappocallis* Matsumura

Tinocallis (*Sappocallis*) *takachihoensis* Higuchi, 1972

Distribution in Türkiye: Trabzon (Görür *et al.* 2011a), Samsun (Akyürek 2013).

Origin region: East Asia.

Subfamily Chaitophorinae Mordvilko

Tribe Chaitophorini Mordvilko

Genus *Chaitophorus* Koch

Chaitophorus indicus Ghosh, Ghosh & Raychaudhuri, 1970

Distribution in Türkiye: Afyonkarahisar, Kütahya (Şenol *et al.* 2015b).

Origin region: Southeast Asia.

Chaitophorus populifolii (Essig, 1912)

Distribution in Türkiye: Niğde (Görür 2004a).

Origin region: North America.

Chaitophorus saliciniger (Knowlton, 1927)

Distribution in Türkiye: İzmir (Eser *et al.* 2009), Trabzon (Görür *et al.* 2009b), Samsun (Akyürek 2013), Afyonkarahisar, Kütahya (Görür 2014).

Origin region: North America.

Subfamily Eriosomatinae Kirkaldy

Tribe Eriosomatini Kirkaldy

Genus *Eriosoma* Leach

Eriosoma lanigerum Hausmann, 1802

Distribution in Türkiye: Trabzon (Schimitschek 1944), Ankara, Bursa, İstanbul (Bodenheimer & Swirski 1957), Adana, Hatay, Mersin, Osmaniye (Toros *et al.* 2002), Diyarbakır (Ölmez Bayhan *et al.* 2003), Isparta (Aslan & Karaca 2005), Kahramanmaraş (Aslan & Uygun 2005) Denizli (Çıraklı *et al.* 2008), Artvin (Görür *et al.* 2009b), Elazığ (Ayaz & Yücel 2010), Antalya (Güleç 2011), Samsun (Akyürek 2013), Aydın (Karakaya 2014), Kütahya (Görür 2014), Yalova (Hantaş *et al.* 2014), Erzincan, Gümüşhane (Alaserhat 2015), Kayseri (Öztürk & Muştu 2017), Bolu (Kaçar 2019).

Origin region: North America.

Tribe *Pemphigini* Herrich-Schaeffer

Genus *Mordwilkoja* Del Guercio

Mordwilkoja vagabunda (Walsh, 1863)

Distribution in Türkiye: Bartın (Yıldız & Toper Kaygın 2010).

Origin region: North America.

Subfamily Hormaphidinae Mordvilko

Tribe Nipponaphidini Ghosh

Genus *Thoracaphis* van der Goot

Thoracaphis flava Takahashi, 1950

Distribution in Türkiye: Kütahya (Şenol *et al.* 2014).

Origin region: Southeast Asia.

Subfamily Lachninae Herrich-Schaeffer

Tribe Eulachnini Baker

Genus *Cinara* Curtis

Subgenus *Cedrobium* Remaudière

Cinara (*Cedrobium*) *laportei* (Remaudière, 1954)

Distribution in Türkiye: Antalya, Burdur, Muğla (Fabre & Chalon 2005), Samsun (Akyürek 2006), Afyonkarahisar (Görür 2014).

Origin region: Africa.

Subgenus *Cinara* Curtis

Cinara (*Cinara*) *cedri* Mimeur, 1936

Distribution in Türkiye: Ankara, Gaziantep, Konya (Tuatay & Remaudière 1964), Afyonkarahisar, Antalya, Burdur, Eskişehir, İstanbul (Çanakçıoğlu 1966), Samsun, Tekirdağ (Tuatay 1999), Hatay (Toros *et al.* 2002), Kahramanmaraş (Aslan & Uygun 2005), Kastamonu (Ünal & Özcan 2005), Bartın (Toper Kaygın *et al.* 2008), Artvin (Görür *et al.* 2009b), Kütahya, Uşak (Görür 2014), Kayseri (Öztürk & Muştu 2017), Çanakkale (Kök & Kasap 2019), Isparta (Oğuzoğlu & Avcı 2019).

Origin region: Africa.

Cinara (*Cinara*) *curvipes* (Patch, 1912)

Distribution in Türkiye: Afyonkarahisar, Bartın, Kütahya (Görür *et al.* 2015).

Origin region: North America.

Cinara (*Cinara*) *indica* Verma, 1970

Distribution in Türkiye: Afyonkarahisar (Şenol *et al.* 2015b).

Origin region: Southeast Asia.

Cinara (*Cinara*) *juniperensis* (Gillette & Palmer, 1925)

Distribution in Türkiye: Kütahya (Şenol *et al.* 2015b).

Origin region: North America.

Cinara (*Cinara*) *pinivora* (Wilson, 1919)

Distribution in Türkiye: Artvin (Görür *et al.* 2011a), Afyonkarahisar, Kütahya, Uşak (Görür 2014).

Origin region: North America.

Cinara (*Cinara*) *wahluca* Hottes, 1952

Distribution in Türkiye: Samsun (Akyürek *et al.* 2010), Kütahya (Görür 2014).

Origin region: North America.

Subfamily Mindarinae Tullgren

Genus *Mindarus* Koch

Mindarus kinseyi Voegtlin, 1995

Distribution in Türkiye: Afyonkarahisar, Uşak (Şenol *et al.* 2015b).

Origin region: North America.

Subfamily Thelaxinae Baker

Tribe Thelaxini Baker, 1920

Genus *Thelaxes* Westwood, 1840

Thelaxes californica (Davidson, 1919)

Distribution in Türkiye: Trabzon (Görür *et al.* 2011a), Samsun (Akyürek 2013), Afyonkarahisar, Kütahya, Uşak (Görür 2014).

Origin region: North America.

Considering the taxonomic diversity of alien aphids, it appears that the aphid fauna of Türkiye includes 592 species belonging to 148 genus in 16 subfamily from the Aphidomorpha infraorder (Hemiptera) (Kök & Özdemir 2021). The highest taxonomic diversity is found in the subfamily Aphidinae with 361 species (60.98%) in 74 genera (50.00%), followed by the subfamily Lachninae with 59 species (9.97%) in 10 genera (6.76%) and the subfamily Calaphidinae with 57 species (9.63%) in 22 genera (14.86%). Similar to these results, the highest taxonomic diversity in the ailen aphid species in Türkiye is seen in the Aphidinae subfamily with 37 species (64.91%) in 20 genera (62.50%), followed by the subfamily Lachninae with seven species (12.28%) in one genus (3.13%) (Table 1).

The number of alien aphid species recorded in Türkiye between 1903 and 2021 significantly and positively correlates with the number of native aphid species in Türkiye ($r=0.980$, $p<0.000$) (Fig. 1). It can be thought that this result may reflect the differences in sampling frequency and in the number of local aphid taxonomists. Accordingly, it can be estimated that in parallel with the increase in the number of aphid species in Türkiye, the number of alien aphid species may increase at the same rate.

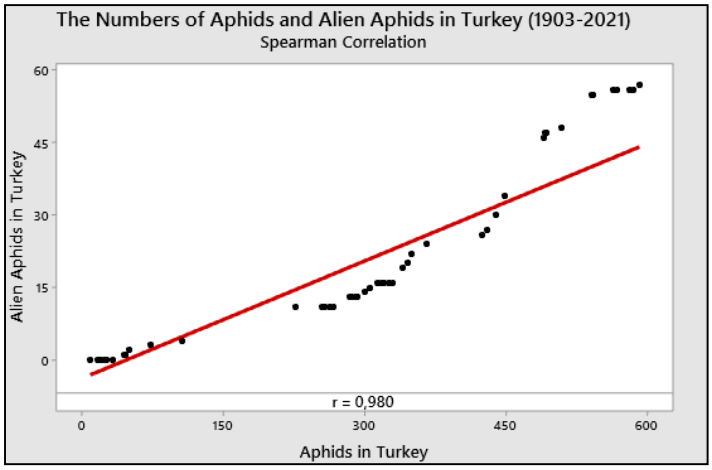

Fig. 1. The relationship between the number aphid species and alien aphid species in Türkiye

Table 1. Taxonomic diversity of aphid species and alien aphid species in Türkiye

	Aphid Species 1903-2021				Alien Aphid Species 1903-2021			
Subfamily	**Genus**	**Genus (%)**	**Species**	**Species (%)**	**Genus**	**Genus (%)**	**Species**	**Species (%)**
Adelgidae	2	1.35	7	1.18	1	3.13	1	1.75
Phylloxerinae	2	1.35	4	0.68	0	0.00	0	0.00
Phylloxerininae	1	0.68	1	0.17	0	0.00	0	0.00
Anoeciinae	1	0.68	3	0.51	0	0.00	0	0.00
Aphidinae	74	50.00	361	60.98	20	62.50	37	64.91
Calaphidinae	22	14.86	57	9.63	4	12.50	4	7.02
Chaitophorinae	5	3.38	35	5.91	1	3.13	3	5.26
Drepanosiphinae	2	1.35	5	0.84	0	0.00	0	0.00
Eriosomatinae	19	12.84	43	7.26	2	6.25	2	3.51
Hormaphidinae	2	1.35	2	0.34	1	3.13	1	1.75
Lachninae	10	6.76	59	9.97	1	3.13	7	12.28
Mindarinae	1	0.68	3	0.51	1	3.13	1	1.75
Phloeomyzinae	1	0.68	1	0.17	0	0.00	0	0.00
Phyllaphidinae	2	1.35	3	0.51	0	0.00	0	0.00
Saltusaphidinae	3	2.03	4	0.68	0	0.00	0	0.00
Thelaxinae	1	0.68	4	0.68	1	3.13	1	1.75
Total	148		592		32		57	

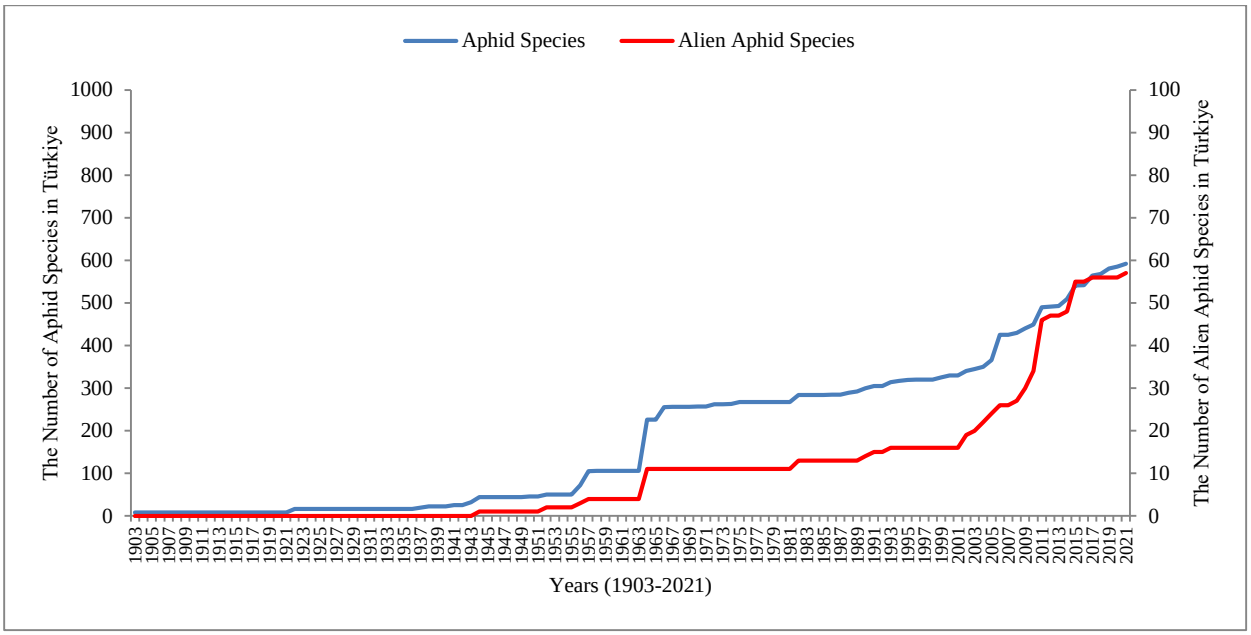

Fig. 2. The number of aphid species and alien aphid species in Türkiye (1903-2021)

The first data on the aphid fauna of Türkiye emerged with 16 aphid species, of which only one is an alien species reported by Trotter (1903), Houard (1922) and Fahringer (1922) in the first quarter of the 20th century. The increase in the aphid fauna of Türkiye continued at a low level until the middle of this century, and reaching 105 aphid species, of which only four were alien species in 1957 (Bodenheimer & Swirski 1957). From that time to the present, the aphid fauna of Türkiye has reached 592 aphid species, 57 of which are alien species; this increase is due to the increased number of native and foreign aphid taxonomists researching in Türkiye as well as the increase in the number of comprehensive faunal studies carried out in different regions. Based on 119 years of data on aphids and alien aphids in Türkiye, the average introduction rate of alien aphids into Türkiye was calculated as 0.48 species per year (Fig. 2).

The alien aphids are distributed in 60 of 81 provinces in Türkiye. The provinces with the highest number of alien aphids were Kütahya, Afyonkarahisar, Samsun, Trabzon and Artvin provinces. Only one alien aphid species was recorded in each of Adıyaman, Bilecik, Edirne, Kastamonu, Kırklareli, Kocaeli, Muğla, Muş, Sinop, Tokat, Tunceli, Zonguldak, Karabük, Kilis, Osmaniye and Düzce provinces (Fig. 3). Provinces with a large number of recorded alien aphid had more comprehensive faunal and taxonomic studies on aphids (Görür *et al.* 2009b, Görür 2014). Also, since the 2000s, the number of alien aphid species has increased significantly due to the rapid increase in the comprehensive faunal and taxonomic studies on aphids in Türkiye. The fact that no alien aphids has been recorded from some provinces of Türkiye can be due to the lack of studies on aphids in these provinces.

The continent origin of 96.5% (55 species) of the alien aphid species belonging to the Aphidomorpha infraorder recorded in Türkiye has been determined, and 1.75% (one species) of the remaining species are of tropical and subtropical origin, and 1.75% (one species) are cryptogenic (unknown origin) such as *Myzus* (*Nectarosiphon*) *persicae* (Sulzer, 1776) which is a serious polyphagous aphid in crop and non-crop areas worldwide. Also, this alien aphid migrates to many herbaceous secondary plants in about 40 plant families, and transmits numerous plant pathogenic viruses (Blackman & Eastop 2022). In Türkiye, 38 of 57 alien aphid species recorded originated from North America. This is followed by the Asian continent with 14 alien aphid species, and African continent with three alien aphid species. It is clear that the continents of Asia and North America have significantly contributed to the number of alien aphid species recorded in Türkiye. Considering the aphids diversity of North America with over 1400 species (Foottit *et al.* 2006) and only China located in Asia continent with over 1,000 species (Qiao & Zhang 2004), it can be thought that the origins of alien aphid species in Türkiye clearly reflect the aphid diversity in these regions.

Discussion

Aphids are phytophagous species distributed worldwide and about 10% of them are serious pests of economically important crops (Blackman & Eastop 2000). In addition, aphids constitute one of the insect groups that are most rapidly affected by global warming and climate change. These changes have caused the emergence of first individuals of aphids in spring to occur 2-3 days earlier every decade (Harrington *et al.* 2007) and led to an increase in the distribution areas of aphids day by day. Aphids can reproduce both parthenogenetically in temperate climates and sexually in cold climates. As a

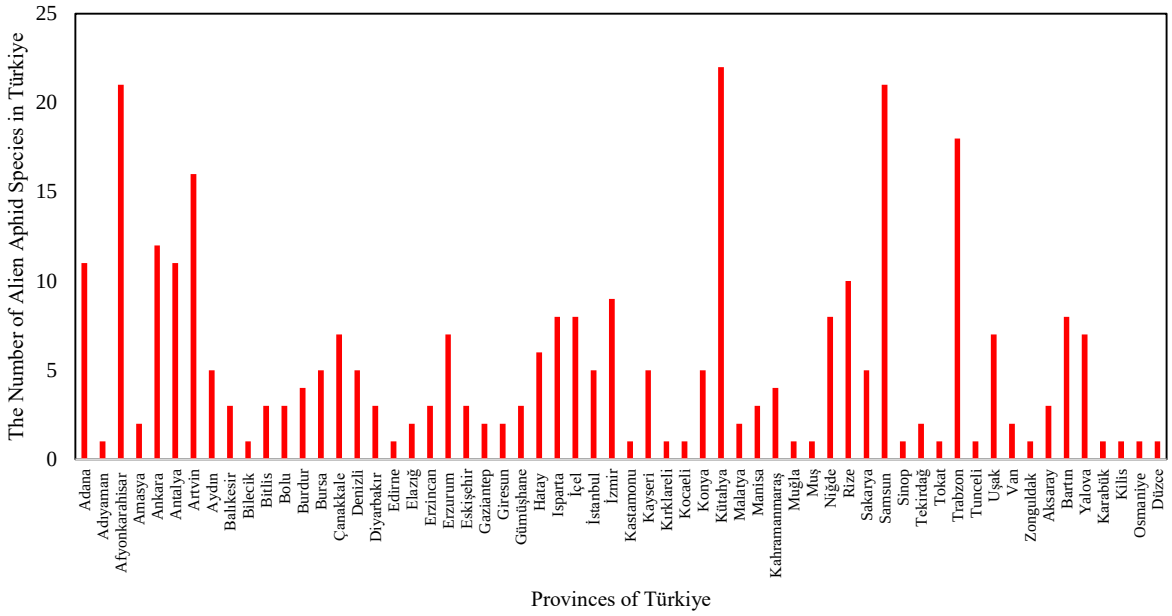

Fig. 3. The distribution of alien aphid species in the provinces of Türkiye

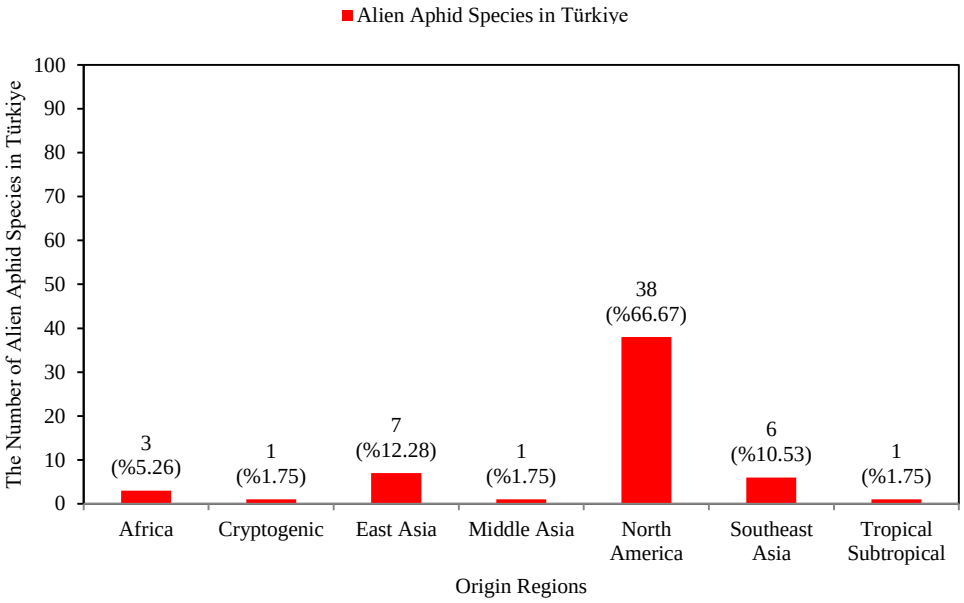

Fig. 4. Origin regions of alien aphid species in Türkiye

result, the introduction of very few or even a single individual female may lead to the rapid development of an aphid population and the increase in alien species. Beside this, aphids with their very small size can be distributed globally in a short time with plant materials (Coeur d'acier *et al.* 2010). For these above mentioned reasons, aphids are one of the most investigated insect groups in terms of taxonomic, biological, ecological and physiological aspects. Recently, the comprehensive studies on alien aphids have also increased. For instance, Coeur d'acier *et al.* (2010) presented a comprehensive list including 102 alien aphid species in 58 genera belonging to 12 subfamilies from the family Aphididae that are distributed in the European continent. In the study, the rate of introduction of alien aphids to the Europe based on 210 years of data was calculated as 0.50 species per year. It was reported that 43.1% of the origins of alien aphid species were reported to be from North America, 43.1% from the Asian continent and the rest from other regions.

Also, a significant positive correlation between aphid species and alien aphid species distributed in the European continent was calculated ($r=0.6226$, $p<0.001$). These results are highly similar to the results of our study

conducted in Türkiye. In a smaller region, Wieczorek (2011) presented a list including 35 alien aphid species originating from other continents into Poland. The author reported that 16 species were Asian, 14 species were North American, two species were tropical Asian, two species were tropical or subtropical regions of the world and one species was cryptogenic. Considering the Polish fauna has a total of 764 aphid taxa (Wojciechowski *et al.* 2015), it can be interpreted that the number of alien aphid species may be closely related to both the number of aphid fauna and the surface area of the countries.

Considering the agricultural importance of alien aphids, *E. lanigerum*, an important apple pest of North America origin, was first reported in nurseries in London in 1787 on the European continent (Balachowsky & Mesnil 1935). The identification of this species was made in Germany by Hausmann (1802). In later years, *E. lanigerum* has spread to many countries in Europe. In Türkiye, this alien aphid was recorded for the first time in Trabzon province by Schimitschek (1944). From this time to the present, *E. lanigerum* has been recorded in most parts of Türkiye except for the provinces where comprehensive faunal studies on aphids have not yet been carried out (Bodenheimer & Swirski 1957, Toros *et al.* 2002, Ölmez Bayhan *et al.* 2003, Aslan & Karaca 2005, Aslan & Uygun 2005, Çıraklı *et al.* 2008, Görür *et al.* 2009, Ayaz & Yücel 2010, Güleç 2011, Akyürek 2013, Karakaya 2014, Görür 2014, Hantaş *et al.* 2014, Alaserhat 2015, Öztürk & Muştu 2017, Kaçar 2019). In addition, *Aphis* (*Aphis*) *illinoisensis* Shimer, 1866, one of the most important pests in vineyard areas in the Mediterranean Basin, was reported in Adana, Afyonkarahisar, Hatay, Isparta, İzmir, Kilis, Kütahya, Mersin and Niğde provinces of Türkiye (Remaudière *et al.* 2003, Görür 2004a, Eser *et al.* 2009, Barjadze *et al.* 2011a, Yanpar 2013, Görür 2014). Of the aphid species reported as aliens for Türkiye in this study are *Myzus* (*Nectarosiphon*) *persicae* (Sulzer, 1776), *Aphis* (*Aphis*) *spiraecola* Patch, 1914, *Macrosiphum* (*Macrosiphum*) *euphorbiae* (Thomas, 1878), *A.* (*A.*) *illinoisensis*, *Acyrthosiphon* (*Acyrthosiphon*) *kondoi* Shinji, 1938, *Myzocallis* (*Lineomyzocallis*) *walshii* (Monell, 1879), *Eriosoma lanigerum* (Hausmann, 1802), *Cinara* (*Cinara*) *cedri* Mimeur, 1936 are important species because they cause serious economic damage every year in crop areas such as fruit and vegetable growing, ornamental plants and viticulture in the worldwide.

As a result, it is expected that the spread of alien species such as aphids, and their settlement in new regions will increasingly continue as long as climate changes caused by global warming, globalization, expanding markets and transportation continue increasingly worldwide. More comprehensive local and territorial faunal studies on alien species should be carried out in order to determine the distribution of these pests and to ensure that measures are taken within the scope of pest control strategies.

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Author Contributions: All authors contributed equally to this manuscript in its all stages.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study has received no financial support.

References

1. Akyıldırım, H., Tepecik, I. & Görür, G. 2011. Aphid species (Hemiptera: Aphidoidea) damage to plants in Büyükada (Istanbul) District, 195-195. Paper presented at the Fourth Plant Protection Congress of Turkey, 28-30 June, Kahramanmaraş-Turkey.
2. Akyıldırım, H., Görür, G., Şenol, Ö. & Demirtaş, E. 2013. Türkiye Afit (Hemiptera, Aphidoidea) Faunası ve İşgalci Elemanlarının Zoocoğrafik Yapısının Değerlendirilmesi. *Biyoloji Bilimleri Araştırma Dergisi*, 6(1): 44-48.
3. Akyıldırım, H., Şenol, Ö., Görür, G., Aktaç, N. & Demirtaş, E. 2014. Determined aphid and ant associations from Trabzon, Rize and Artvin Provinces of the Turkey. *Journal of the Entomological Research Society*, 16(2): 29-37.
4. Akyürek, B. 2006. *Ondokuz Mayıs Üniversitesi Kurupelit Kampüs Alanı Afit (Homoptera: Aphididae) Faunasının Belirlenmesi*. M.Sc. Thesis, Graduate School of Science and Engineering, Ondokuz Mayıs University, Samsun, 108 pp.
5. Akyürek, B., Zeybekoğlu, Ü. & Görür, G. 2010. New records of aphid species (Hemiptera: Aphidoidea) for the Turkish fauna from Samsun province. *Turkish Journal of Zoology*, 34(2): 421-424.
6. Akyürek, B., Zeybekoğlu, Ü. & Görür, G. 2011. Further contributions to the Turkey aphid (Hemiptera: Aphidoidea) fauna. *Journal of Entomological Research Society*, 13(3): 101-106.
7. Akyürek, B., Zeybekoğlu, Ü. & Görür, G. 2012. Ondokuz Mayıs Üniversitesi Kurupelit Yerleşkesi (Samsun)'nin yaprakbiti (Hemiptera: Aphididae) türleri ve konukçu bitkileri. *Türkiye Entomoloji Bülteni*, 2(2): 91-108.
8. Akyürek, B. 2013. *Samsun Ili Aphididae (Hemiptera: Aphidoidea) Familyası Türlerinin Taksonomik Yönden Incelenmesi*. PhD. Thesis, Graduate School of Science and Engineering, Ondokuz Mayıs University, Samsun, 378 pp.
9. Alaserhat, I. 2015. *Erzincan ve Gümüşhane Illerinde Yetiştirilen Ilıman Iklim Meyve Türlerinde Bulunan Aphididae (Hemiptera) Türleri, Yoğunlukları, Doğal Düşmanları ve Sekonder Konukçularının Belirlenmesi*. PhD. Thesis, Graduate School of Science and Engineering, Atatürk University, Erzurum, 318 pp.
10. Alford, D.V. 2011. *Plant Pests*. Harper Collins Publishers, London, 822 pp.

11. Alkan, B. 1952. Türkiye'nin zoosesidleri (Kökeni Hayvansal Bitki Urları) üzerinde çalışmalar. *Zirai Mücadele Araştırmaları Yıllığı*, 1: 6-29.
12. Altay, H. & Uysal, M. 2005. Selçuk Üniversitesi Alaeddin Keykubat kampüs alanında bulunan yaprakbiti (Homoptera: Aphidoidea) türleri. *Selçuk Üniversitesi Ziraat Fakültesi Dergisi*, 19(37): 92-99.
13. Aslan, B. & Karaca, I. 2005. Fruit tree aphids and their natural enemies in Isparta region, Turkey. *Journal of Pest Science*, 78: 227-229.
14. Aslan, M.M. & Uygun, N. 2005. Aphids (Homoptera: Aphididae) of Kahramanmaras Province, Turkey. *Turkish Journal of Zoology*, 29: 201-209.
15. Ayaz, T. & Yücel, A. 2010. Elazığ ili elma alanlarında bulunan zararlı ve yararlı arthropod türlerinin belirlenmesi üzerine araştırmalar. *Harran Üniversitesi Ziraat Fakültesi Dergisi*, 14(1): 9-16.
16. Ayyıldız, Y. & Atlıhan, R. 2006. Balıkesir ili sebze alanlarında görülen yaprak biti türleri ve doğal düşmanları. *Yüzüncü Yıl Üniversitesi Ziraat Fakültesi Tarım Bilimleri Dergisi*, 16(1): 1-5.
17. Balachowsky, A. & Mesnil, L. 1935. *Les Insectes Nuisibles aux Plantes Cultivées, Leurs Mœurs, Leur Destruction*. Presses éts busson: Paris, 1137 pp.
18. Barjadze, Sh., Karaca, I. & Yaşar, B. 2011a. The Grapevine aphid, *Aphis illinoisensis* Shimer, 1866 (Hemiptera: Aphididae): An invasive pest in Isparta Province (Turkey). *Türkiye Entomoloji Bülteni*, 1(2): 119-121.
19. Barjadze, Sh., Karaca, I., Yaşar, B. & Japoshvili, G. 2011b. The yellow rose aphid *Rhodobium porosum*: a new pest of Damask rose in Turkey. *Phytoparasitica*, 39(1): 59-62.
20. Barjadze, Sh., Japoshvili, G., Karaca, I. & Özdemir, I. 2014. Aphids (Hemiptera: Aphidoidea) of Gölcük Natural Park (Isparta Province, Turkey). *Munis Entomology & Zoology Journal*, 9(1): 206-213.
21. Başer, G. & Tozlu, G. 2020. Atatürk Üniversitesi Kampüsü (Erzurum)'nde bazı yabancı otlar üzerinde bulunan afit (Hemiptera: Aphididae) türlerinin belirlenmesi. *Bitki Koruma Bülteni*, 60(2): 99-110.
22. Bayındır Erol, A., Arzuman, Ş. Özdemir, I. & Karaca, I. 2018. Isparta ili kampüs alanları içerisinde belirlenen yaprakbiti (Hemiptera: Aphididae) türleri. *Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 22(2): 1045-1053.
23. Blackman, R.L 1974. Life-cycle variation of *Myzus persicae* (Sulz.) (Hom., Aphididae) in different parts of the world, in relation to genotype an environment, *Bulletin of Entomological Research*, 63: 595-607.
24. Blackman, R.L. & Eastop, V.F. 2000. *Aphids on the World's Crops. An identification guide (second edition)*. Wiley, J. Chichester, 466 pp.
25. Blackman, R.L. & Eastop, V.F. 2022. Aphids on the World's Plants. An Online Identification and Information Guide. http://www.aphidsonworldsplants.info (Date accessed: 23.01.2022).
26. Bodenheimer, F.S. & Swirski, E. 1957. *The Aphidoidea of the Middle East*. The Weizmann Science Press of Israel, Jerusalem, 378 pp.
27. Çalışkan, A.F., Ulusoy, M.R. & Özdemir, I. 2012. Türkiye'de meşede yeni yayılıcı yaprakbiti türü: *Myzocallis walshii* (Monell, 1879) (Hemiptera: Aphidoidea). *Türkiye Entomoloji Bülteni*, 2(2): 277-283.
28. Çalışkan, A.F. 2015. *Adana Ili Park ve Peyzaj Alanlarında Zararlı Olan Sternorrhyncha (Hemiptera) (Aleyrodidae, Coccoidea, Aphididae) Türlerinin Saptanması*. PhD. Thesis, Graduate School of Science and Engineering, Çukurova University, Adana, 315 pp.
29. Çanakçıoğlu, H. 1966. Türkiye'de orman ağaçlarına arz olan bitkibitleri (Aphidoidea) üzerine araştırmalar. *Istanbul Universitesi Orman Fakültesi Dergisi*, 16(2): 131-139.
30. Çanakçıoğlu, H. 1975. *The Aphidoidea of Turkey*. Istanbul University Faculty of Forestry Publications, Istanbul, 309 pp.
31. Çıraklı, A., Görür G. & Isık, M. 2008. Denizli il merkezinde tespit edilen afit (Hemiptera: Aphidoidea) türleri. *Selcuk University Agricultural Faculty Journal*, 22: 12-18.
32. Coeur d'acier, A., Hidalgo, N.P. & Petrović-Obradović, O. 2010. Aphids (Hemiptera, Aphididae) Chapter 9.2. *BioRisk*, 4(1): 435-474.
33. Diehl, E., Sereda, E., Wolters, V. & Birkhofer, K. 2013. Effects of predator specialization, host plant and climate on biological control of aphids by natural enemies: A meta-analysis. *Journal of Applied Ecology*, 50(1): 262-270.
34. Düzgüneş, Z. & Tuatay, N. 1956. *Türkiye Aphid'leri*. Ziraat Vekaleti, Ankara Zirai Mücadele Enstitüsü Müdürlüğü Yayınları, Ankara, 64 pp.
35. Düzgüneş, Z., Toros, S., Kılınçer, N. & Kovancı, K. 1982. *Ankara Ilinde Bulunan Aphidoidea Türlerinin Parazit ve Predatörlerinin Tesbiti*. Tarım ve Orman Bakanlığı, Zirai Mücadele ve Karantina Genel Müdürlüğü Yayınları, Ankara, 251 pp.
36. Eser, S., Görür, G., Tepecik, I. & Akyıldırım, H. 2009. Aphid (Hemiptera: Aphidoidea) species of the Urla district of Izmir region. *Journal of Applied Biological Sciences*, 3(1): 89-92.
37. Fabre, J.P. & Chalon, A. 2005. Multiplication of an ecotype of the aphid *Cedrobium laportei* (Homoptera Lachnidae) on various provenances of the genus *Cedrus* spp. pp. 123-138. In: Lieutier, E. & Ghaioule, D. (eds.). *Entomological Research in Mediterranean Forest Ecosystems*. INRA Editions, Paris, 247 pp.
38. Fahringer, J. 1922. Eine Rhyncotenausbeute der Turkei, Kleinasien und den benachbarten Gebieten. *Konowia*, 1: 296-307.
39. Favret, C. 2022. Aphid Species File. Version 5.0/5.0. http://Aphid.SpeciesFile.org (Date accessed: 23.01.2022).
40. Foottit, R.G., Halbert, S.E., Miller, GL., Maw, E. & Russell, L.M. 2006. Adventive aphids (Hemiptera: Aphididae) of America north to Mexico. *Proceedings of the Entomological Society of Washington*, 108: 583-610.

41. Geneci, E. & Görür, G. 2007. Aphid (Homoptera: Aphididae) species of the Central Aksaray. *International Journal of Engineering Science*, 1: 19-21.

42. Giray, H. 1974. Izmir ili ve çevresinde Aphididae familyası türlerine ait ilk liste ile bunların konukçu ve zarar şekilleri Hakkında Notlar. *Ege Üniversitesi Ziraat Fakültesi Dergisi*, 11(1): 39-69.

43. Görür, G. 2002. New records for Turkish aphid fauna (Homoptera: Aphididae). *Zoolology in the Middle East*, 25(1): 67-69.

44. Görür, G. 2004a. *Aphid (Insecta: Homoptera: Aphidoidea) Species of Nigde Province of Turkey*. No. 17. Nigde University Publications, Nigde, 140 pp.

45. Görür, G. 2004b. Aphid (Homoptera: Aphidoidea) species on pome fruit trees in Niğde province of Turkey. *Turkish Journal of Entomology*, 28(1). 21-26.

46. Görür, G., Işık, M., Akyürek, B. & Zeybekoğlu, Ü. 2009a. New records of Aphidoidea from Turkey. *Journal of Entomolological Research Society*, 11(3): 1-5.

47. Görür, G., Zeybekoğlu, Ü., Akyürek B., Işık, M. & Akyıldırım, H. 2009b. *Trabzon, Rize ve Artvin Illerinin Afit (Homoptera: Aphididae) Faunasının Belirlenmesi*. Turkish Scientific Research Council Project Reports, Ankara, 223 pp.

48. Görür, G., Akyıldırım, H., Akyürek, B. & Olcabey, G. 2011a. A contribution to the knowledge of the Turkish aphid (Hemiptera: Aphidoidea) fauna. *EPPO Bulletin*, 41(2): 185-188.

49. Görür, G., Tepecik, I., Akyıldırım, H. & Olcabey, G. 2011b. Additions to the Turkish Aphid fauna (Hemiptera: Aphidoidea: Aphididae). *North-Western Journal of Zoology*, 7(2): 318-321.

50. Görür, G., Akyıldırım, H., Olcabey, G. & Akyürek, B. 2012. The aphid fauna of Turkey: An updated checklist. *Archives of Biological Science Belgrade*, 64(2): 675-692.

51. Görür, G. 2014. *Iç Batı Anadolu Bölümü Afit (Hemiptera: Aphidoidea) Faunasının Belirlenmesi*. Turkish Scientific Research Council Project Reports, Ankara, 235 pp.

52. Görür, G., Toper Kaygın, A., Şenol, Ö. & Akyıldırım Beğen, H. 2015. *Cinara curvipes* (Patch, 1912) (Hemiptera; Aphididae) as new aphid species for Turkish aphidofauna. *Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi*, 16(1): 37-39.

53. Güleç, G. 2011. *Antalya Şehri Park Alanlarinda Aphidoidea (Hemiptera) Türlerinin Saptanmasi ve Doğal Düşmanlarinin Belirlenmesi*. PhD. Thesis, Graduate School of Science and Engineering, Ankara University, Ankara, 325 pp.

54. Hantaş, C., Çetin, G. & Akçay, M.E. 2014. Marmara Bölgesi ayva bahçelerinde zararlı böcek ve akar türleri ile doğal düşmanlarının saptanması ve önemli zararlı türlerin popülasyon değişimi. *Bitki Koruma Bülteni*, 54(3): 283-302.

55. Harrington, R., Clark, S.J., Welham, S.J., Verrier, P.J., Denholm, C.H., Hullé, M., Maurice, D., Rounsevell, M.D., Cocu, N. & European Union Examine Consortium. 2007. Environmental change and the phenology of European aphids. *Global Change Biology*, 13: 1550-1564.

56. Hausmann, F. 1802. Beiträge zu den materialien für eine künftige Bearbeitung der Gattung der Blattlause. *Magazin für Insektenkunde*, 1(3): 426-445.

57. Houard, C. 1922. *Les Zoocécidies des Plantes d'Afrique, d'Asie et d'Océanie. Vol. 1. Cyrptogames, Gymnospermes, Monocotylédones, Dicotylédones*. Librairie Scientifique Jules Hermann, Rue de la Sorbonne, Paris, 496 pp.

58. Hullé, M., d'Acier A.C., Bankhead-Dronnet, S., Harrington, R. 2010. Aphids in the face of global changes. Biologies, 333: 497-503.

59. Hulme, P.E., Roy, D.B., Cunha, T. & Larsson, T.B. 2009. A pan-European inventory of alien species: rationale, implementation and implications for managing biological invasions. Pp. 1-14. In: *DAISIE (Delivering Alien Invasive Species Inventories for Europe) (Ed.) Handbook of Alien Species in Europe*. Springer, Dordrecht, 399 pp.

60. IPCC, 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., Qin, D., Manning, M., Chen, Z.N., Marquis, M., Avery, K.B., Tignor, M. & Miller, H.L. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, 996 pp.

61. Jouraeva, V.A., Johnson, D.L., Hassett, J.P., Nowak, D.J., Shipunova, N.A. & Barbarossa, D. 2006. Role of sooty mold fungi in accumulation of fine-particle-associated PAHs and metals on deciduous leaves. *Environmental Research*, 102: 272-282.

62. Kaçar, G. 2019. Seben (Bolu) elma bahçelerinde belirlenen zararlı, yararlı türler ve biyoekolojileri. *International Journal of Agriculture and Wildlife Science*, 5(2): 286-291.

63. Karakaya, I.S. 2014. *Aydın Ilinde Yumuşak ve Sert Çekirdekli Meyve Ağaçlarında Zararlı Yaprakbiti (Hemiptera: Aphidoidea) Türleri ile Parazitoit ve Predatörlerinin Saptanması*. MSc. Thesis, Graduate School of Science and Engineering, Adnan Menderes University, Aydın, 64 pp.

64. Katis, N.I., Tsitsipis, J.A., Stevens, M. & Powell, G. 2007. Transmission of plant viruses. pp. 353-390. In: H. F. Van Emden & R. Harrington (Eds.). Aphids As Crop Pests. CABI, Wallingford, 714 pp.

65. Kaya Apak, F. & Akşit, T. 2016. Natural enemies and population dynamics of the blackmargined aphid (*Monellia caryella* (Fitch) Aphididae, Hemiptera) on pecan trees in Aydın, Turkey. *Journal of the Entomological Research Society*, 18(3): 49-60.

66. Kök, Ş., Kasap, I. & Özdemir, I. 2016. Aphid (Hemiptera: Aphididae) species determined in Çanakkale Province with a new record for the aphid fauna of Turkey. *Turkish Journal of Entomology*, 40(4): 397-412.

67. Kök, Ş. & Kasap, I. 2019. Aphid (Hemiptera: Aphididae) species of the South Marmara Region of Turkey including the first record of *Dysaphis radicola meridialis* Shaposhnikov, 1964 for the aphid fauna of Turkey. *Turkish Journal of Entomology*, 43(1): 63-78.

68. Kök, Ş. & I. Özdemir, 2021. Annotated systematic checklist of the aphids (Hemiptera: Aphidomorpha) of Turkey. *Zootaxa*, 4925: 1-74.

69. Kovancı, O.B., Gençer, N.S., Kovancı, B. & Akgül, H.C. 2004. Bursa ili çilek alanlarında bulunan homoptera türleri. *Tarım Bilimleri Dergisi*, 10(3): 318-322.

70. Kuloğlu, I. & Özder, N. 2017. Aphids (Hemiptera: Aphididae) on ornamental plants from Yalova Province, Turkey. *COMU Journal of Agriculture Faculty*, 5(2): 69-72.

71. Oğuzoğlu, Ş. & Avcı, M. 2019. Natural enemies of *Cinara cedri* Mimeur 1936 (Hemiptera: Aphididae) in cedar forests in Isparta Regional Forest Directorate. *Kastamonu University Journal of Forestry Faculty*, 19(2): 173-185.

72. Oğuzoğlu, Ş., Şenol, Ö., Avcı, M. & Görür, G. 2021. An invasive species for Turkish aphid fauna: *Siphonatrophia cupressi* (Swain, 1918) (Hemiptera: Aphididae). *Munis Entomology & Zoology*, 16(1): 260-264.

73. Ölmez Bayhan, S., Ulusoy, M.R. & Toros, S. 2003. Determination of Aphididae (Homoptera) fauna of Diyarbakir province of Turkey. *Turkish Journal of Entomology*, 27(4): 253-268.

74. Ölmez Bayhan, S., Ulusoy, M.R. & Bayhan, E. 2006. Aphids and their predators in Malatya Region and around Turkey. *Journal of Biological Sciences*, 6(5): 954-957.

75. Özdemir, I. & Toros, S. 1997. Ankara parklarında mevsimlik süs bitkilerinde zararlı Aphidoidea (Hom.) Türleri. *Turkish Journal of Entomology*, 21(4), 283-298.

76. Özdemir, I., Remaudière, G., Toros, S. & Kılınçer, N. 2005. New aphid records from Turkey including the description of a new *Lachnus* species (Hemiptera: Aphididae). *Revue française d'entomologie, Nouvelle Série*, 27(3): 97-102.

77. Özdemir, I. 2020. Some New records on aphid (Hemiptera, Aphididae) fauna of Turkey and aphid host plant interactions. *Journal of the Entomological Research Society*, 22(2): 191-201.

78. Özkan, A. & Türkyilmaz, N. 1990. Antalya ilinde sarı yaprakbiti *Monellia caryella* (Fitch) (Hom. Aphididae)'in Pikan çeşitlerindeki tercih durumlari üzerinde arastirmalar. *Derim Dergisi*, 7(4): 47-149.

79. Öztürk, D.Ö. & Muştu, M. 2017. Kayseri'nin merkez ilçelerinde süs bitkilerinde bulunan yaprakbiti (Hemiptera: Aphididae) türleri. *Türkiye Entomoloji Bülteni*, 7(4): 277-292.

80. Qiao, G. & Zhang, G.X. 2004. Prelimary study of aphid diversity in China: taxonomic and geographic variation. pp. 139-146. In: Simon, J. C., Dedryver, C. A., Rispe, C. & Hullé, M. (Eds.) *Aphids in a New Millenium. Proceedings of the 6th International Symposium on Aphids*. INRA Editions, Rennes, 549 pp.

81. Remaudière, G., Sertkaya, E. & Özdemir, I. 2003. Alerte! Découverte en Turquie du puceron americain *Aphis illinoisensis* nuisible à la vigne (Hemiptera, Aphididae). *Revue française d'entomologie, Nouvelle Série*, 25(4): 170-172.

82. Remaudière, G., Toros, S. & Özdemir, I. 2006. New contribution to the aphid fauna of Turkey (Hemiptera: Aphidoidea). *Revue française d'entomologie, Nouvelle Série*, 28(2): 75-96.

83. Saraç, I., Özdemir, I. & Karaca, I. 2015. Aphids species in citrus orchards of Antalya Province. *Munis Entomology & Zoology Journal*, 10(2): 358-369.

84. Schimitschek, E. 1944. *Forstinsekten der Turkei und igre Umvelt*. Volk und Reich Verlag, Berlin, 371 pp.

85. Şenol, Ö., Akyıldırım, H., Görür, G. & Demirtaş, E. 2014. New records for the aphid fauna (Hemiptera: Aphidoidea) of Turkey. *Acta Zoologica Bulgarica*, 66(1): 133-136.

86. Şenol, Ö., Akyıldırım Beğen, H., Görür, G. & Gezici, G. 2015a. Some new aphid records for the Turkish aphidofauna (Hemiptera: Aphidoidae). *Zoology in the Middle East*, 61(1): 90-92.

87. Şenol, Ö., Akyıldırım Beğen, H., Görür, G. & Demirtaş, E. 2015b. New additions and alien aphids for Turkey's aphidofauna (Hemiptera: Aphidoidea). *Turkish Journal of Zoology*, 39: 39-45.

88. Şenol, Ö., Görür, G. & Akyıldırım Beğen, H. 2017. Recent findings on aphid fauna from east and south eastern parts of Turkey. *Biological Diversity and Conservation*, 10(3): 76-78.

89. Tepecik, I., Olcabey, G., Akyıldırım, H. & Görür, G. 2011. Aphid species determined on plants in karabük province and contribution to the Turkey aphid fauna, 201-201. Paper presented at the Fourth Plant Protection Congress of Turkey, 28-30 June, Kahramanmaraş-Turkey.

90. Toper Kaygin, A., Görür, G. & Çota, F. 2008. Contribution to the aphid (Homoptera: Aphididae) species damaging on woody plants in Bartın, Türkiye. *International Journal of Engineering Science*, 2(1): 83-86.

91. Toper Kaygın, A., Görür, G. & Çota, F. 2009. Aphid (Hemiptera: Aphididae species determined on herbaceous and shrub plants in Bartin Province in Western Blacksea Region of Turkey. *African Journal of Biotechnology*, 8(12): 2893-2897.

92. Toros, S., Yaşar, B., Özgökçe, M.S. & Kasap, I. 1996. Van ilinde Aphidoidea (Homoptera) üstfamilyasına bağlı türlerin saptanması üzerinde çalışmalar, 549-556. Paper presented at the Third Turkish National Congress of Entomology, 24-28 September, Ankara-Turkey.

93. Toros, S., Uygun N., Ulusoy, R., Satar, S. & Özdemir, I. 2002. *Doğu Akdeniz Bölgesi Aphidoidea Türleri (The Aphidoidea Species of East Mediterranean Region)*. Tarım ve Köyisleri Bakanlığı, Tarımsal Arastırmalar Genel Müdürlügü Yayınları, Ankara, 108 pp.

94. Trotter, A. 1903. Galle della Peninsola Balcanica e Asia Minore. *Nuovo Giornale Botanico Italiano, Nuova Serie*, 10: 1-86.

95. Tuatay, N. & Remaudière, G. 1964. Première contribution au catalogue des Aphidida (Hom.) de la Turquie. *Revue de pathologie végétale et d'entomologie agricole de France*, 43(4): 243-278.

96. Tuatay, N., Kalkandelen, A. & Aysev, N. 1972. *Nebat Koruma Müzesi Böcek Kataloğu (1961–1971)*. T.C. Tarım Bakanlığı Zirai Mücadele ve Zirai Karantina Genel Müdürlüğü Yayınları, Ankara, 119 pp.

97. Tuatay, N. 1988. Türkiye yaprakbitleri (Homoptera: Aphididae) I. Aphidinae: Macrosiphini I. Kısım. *Plant Protection Bulletin*, 28(1): 83-105.

98. Tuatay, N. 1990. Türkiye Yaprakbitleri (Homoptera: Aphididae) II. Aphidinae: Macrosiphini (II. Kısım). *Plant Protection Bulletin*, 30(1): 29-43.

99. Tuatay, N. 1991. Türkiye Yaprakbitleri (Homoptera: Aphididae) I. Aphidinae: Macrosiphini (III. Kısım). *Plant Protection Bulletin*, 31(1-4): 3-18.

100. Tuatay, N. 1993. Aphids of Turkey (Homoptera: Aphididae) IV. Aphidinae: Macrosiphini Part IV. *Plant Protection Bulletin*, 33(1-2): 83-105.

101. Tuatay, N. 1999. Türkiye Yaprakbitleri (Homoptera: Aphididae): V. Chaitophorinae, Lachninae ve Thelaxinae. *Plant Protection Bulletin*, 39(1): 1-21.

102. Ünal, S. & Özcan E. 2005. Kastamonu yöresi Aphididae (Homoptera) türleri. *Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi*, 6(1): 76-83.

103. van Emden, H.F. & Harrington, R. 2007. Aphids as Crop Pests. CABI Publishing, London, 717 pp.

104. Wieczorek, K. 2011. Aphid species alien to Poland (Hemiptera: Aphididae). *Polish Journal of Entomology*, 80(2): 203-221.

105. Wojciechowski, W., Depa, Ł., Kanturski, M., Węgierek, P. & Wieczorek, K. 2015. An annotaded checklist of the Aphids (Hemiptera: Aphidomorpha) of Poland. *Polish Journal of Entomology*, 4: 383-420.

106. Yanpar, R. 2013. *Mersin Ili Bağlarında Zararlı Olan Yaprakbiti Türleri, Parazitoit ve Predatörleri ile Aphis illinoisensis'in Popülasyon Gelişmesinin Belirlenmesi*. M.Sc. Thesis, Graduate School of Science and Engineering, Çukurova University, Adana, 60 pp.

107. Yerlikaya, H., Başpınar, H. & Yıldırım, E.M. 2016. Aydın Il Merkezinde turunç *Citrus aurantium* L. (Rutaceae) ağaçlarında bulunan Coccoidea üst familyası ile Aphididae ve Aleyrodidae familyaları (Hemiptera)'na bağlı türlerin saptanması, bulaşma oranlarının ve doğal düşmanlarının belirlenmesi. *Türkiye Entomoloji Bülteni*, 6(3): 221-230.

108. Yıldız, Y. & Toper Kaygın, A. 2010. *Mordwilkoja vagabunda* (Walsh, 1863) a new record for Turkey Aphid (Hemiptera, Aphididae: Pemphigini) Fauna. *Journal of Entomological Research Society*, 12(2): 97-102.

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S23-S29, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1106190

Research Article
Special Issue: Biodiversity of Insects

A NEW SPECIES OF THE GENUS *Leptobium* Casey (COLEOPTERA: STAPHYLINIDAE: PAEDERINAE) FROM CENTRAL NORTHERN ANATOLIA, AND A DISTRIBUTIONAL CHECKLIST TO TURKISH SPECIES

Sinan ANLAŞ

Manisa Celal Bayar University, Alaşehir Vocational School, TR-45600, Alaşehir, Manisa, TÜRKİYE
e-mail: sinan.anlas@gmail.com, ORCID iD: orcid.org/0000-0001-7059-5677

http://zoobank.org/urn:lsid:zoobank.org:pub:15398A4F-F772-4ABF-B2E6-B1D1B7DF466A

Cite this article as:

Anlaş S. 2022. A new species of the genus *Leptobium* Casey (Coleoptera: Staphylinidae: Paederinae) from central northern Anatolia, and a distributional checklist to Turkish species. *Trakya Univ J Nat Sci*, 23(Special Issue): S23-S29, DOI: 10.23902/trkjnat.1106190

Received: 20 April 2022, Accepted: 03 July 2022, Online First: 14 July 2022, Published: 20 July 2022

Edited by:
Kadri KIRAN

Key words:
Rove beetles
Fauna
Endemism
Taxonomy
Leptobium orgeli sp. n.

Abstract: In this study, a new species of the genus *Leptobium* Casey, *Leptobium orgeli* sp. n. (Çorum province) from central northern Anatolia in Türkiye is described, illustrated, and distinguished from congeners. A total of 21 species is currently known from Türkiye. A distributional checklist of *Leptobium* of Türkiye is provided. Distributions of the endemic *Leptobium* species in central northern Anatolia are mapped. In addition, new and additional distribution data for 10 species of *Leptobium* are reported from different countries of the Palearctic Region. The material examined was based on specimens collected between 1927 and 2021, and contained additional specimens in European museums and Alaşehir Zoological Museum.

Özet: Bu çalışmada, Türkiye'den *Leptobium* Casey cinsine ait bir yeni türün, *Leptobium orgeli* sp. n. (Çorum) deskripsiyonu yapılmış, şekillendirilmiş ve benzer türlerden ayrımı gösterilmiştir. Böylece, Türkiye'den bilinen tür sayısı 21 olmuştur. Türkiye'de bulunan *Leptobium* türlerine ait dağılımsal bir kontrol listesi verilmiştir. Orta kuzey Anadolu'da bulunan endemik *Leptobium* türlerinin yayılışı haritalandırılmıştır. Ayrıca, Palearktik Bölge'deki farklı ülkelerde bulunan *Leptobium* cinsine bağlı 10 türe ait yeni ve ek dağılımsal kayıtlar verilmiştir. İncelenen materyali, 1927-2021 yılları arasında toplanmış örnekler oluşturmakta olup, Avrupa müzeleri ve Alaşehir Zooloji Müzesi'nde bulunan örnekleri içermektedir.

Introduction

The genus *Leptobium* Casey, 1905 (Coleoptera: Staphylinidae: Paederinae) is represented by 74 species and two subspecies in the Palaearctic region (Schülke & Smetana 2015, Assing 2017, Anlaş & Örgel 2020). According to Assing (2005), the complete distribution of *Leptobium* includes the south of the Palaearctic region from the Canary Islands to the Russian Far East, with *Leptobium gracile* (Gravenhorst, 1802) reaching into the northeast of the Ethiopian region. But the vast majority of species of the genus are distributed in the Mediterranean region and the Middle East, with the highest species diversity in Türkiye, where 20 species have been recorded so far (Anlaş & Örgel 2020), corresponding approximately one quarter of the known species in the Palaearctic region.

Leptobium species can be found in almost any habitat providing optimal humidity and water supplies. They mostly can be collected in unforested habitats such as meadows and pastures, as well as in forest, on flowers and lakeshores, usually at lower to intermediate elevations (Assing 2005, Anlaş 2012). According to Assing (2005), little is known about the phenology and biology of *Leptobium* species. According to Assing (2005), adults can be seen throughout the year, but they are much more common in spring. Also, teneral specimens of some species can be found both in spring and in late autumn. According to the published data on the genus and to personal observations, species of the genus are most probably predators of other invertebrates.

Most species of *Leptobium* are difficult to identify by external characters. A reliable identification at species level is possible only based on an examination of male sexual characters.

This study is mainly based on field studies in central northern Anatolia carried out within the scope of a

research project. During the field trips in Çorum province, a new *Leptobium* species has been discovered. The number of currently known *Leptobium* species, including the newly described species, in Türkiye is 21, among which 17 are endemic to the country. New and additional distribution data for nine species of the genus are reported from different countries of the Palearctic Region.

Materials and Methods

The material of the study was obtained from the specimens collected from Algeria, Croatia, Greece, Russia, Tunusia and Türkiye between 1927 and 2021. The specimens collected from Türkiye were sampled using aspirator and sifter methods. The material was examined under a Stemi 508 microscope (Zeiss Germany). All photographs were obtained using a digital camera (Zeiss Axiocam 208). All photographs were edited with Helicon Focus v. 6, and Corel Draw v. X7. A distribution map of the endemic *Leptobium* species in central northern Anatolia was prepared using the Google Earth Pro (2021) software. Nomenclature of the terminalia and the style of the description of *Leptobium orgeli* sp. n. follows Assing (2005).

Body length was measured from the anterior margin of the mandibles to the abdominal apex, head length was measured from the anterior margin of the clypeus to the neck, the length of pronotum was measured along the median line, the length of elytra from the apex of the scutellum to the posterior margin of the elytra (at the suture), and the length of the aedeagus from the apex of the ventral process to the base of the bulbus.

Abbreviations used to indicate collections where the studied material is deposited are as follows:

AZMM-Alaşehir Zoological Museum, Manisa Celal Bayar University, Türkiye (S. Anlaş) .

HNHM-Hungarian Natural History Museum, Budapest, Hungary (G. Makranczy, O. Merkl).

IRSNB-Institut Royal des Sciences Naturelles de Belgique, Bruxelles (W. Dekoninck).

MNHNP-Muséum National d'Histoire Naturelle, Paris, France (T. Deuve, A. Taghavian).

ZIN-Zoological Institute, Russian Academy of Sciences, St Petersburg (B. A. Korotyaev).

Results

Taxonomy

Family STAPHYLINIDAE Latreille

Subfamily Paederinae Fleming

Tribe Paederini Fleming

Subtribe Dolicaonina Casey

Leptobium orgeli sp. n. (Figs 1, 2)

http://zoobank.org/urn:lsid:zoobank.org:act:35AACA37-C3AD-4614-952C-53F329763EAE

Type Material: Holotype: TÜRKİYE: ♂, "TR. Çorum province, Osmancık, Danişment 4 km SW, 1400 m, 41°04'23"N, 34°58'24"E, 01.V.2021, leg. Örgel, Kacar & Çelik. / Holotypus ♂, *Leptobium orgeli* sp. n. det. S. Anlaş 2022" (AZMM). Paratypes: 15♂♂, 10♀♀, same data as holotype (AZMM). 3♂♂, 3♀♀, Osmancık, Danişment 3 km S, 1490 m, 41°04'36"N, 34°55'48"E, 01.V.2021, leg. Örgel, Kacar & Çelik (AZMM). 13♂♂, 8♀♀, Osmancık, Danişment 3 km E, 1461 m, 41°04'37"N, 34°56'04"E, 01.V.2021, leg. Örgel, Kacar & Çelik (AZMM). 4♂♂, 5♀♀, Osmancık, Danişment 4 km S, 1480 m, 41°04'26"N, 34°57'03"E, 01.V.2021, leg. Örgel, Kacar & Çelik (AZMM).

Description: Habitus as in Fig. 1a. Body 7.9-8.5 mm long. Colouration: head, pronotum, and abdominal segments III-VI black; elytra and abdominal segments VIII-X rufous, segment VII distinctly bicoloured with broad posterior margin rufous; antennae reddish and legs yellowish brown.

Head slightly oblong, approximately 1.05-1.10 times as long as wide (Figs 1a-b); integument without microreticulation; eyes approximately half as long as postocular region in dorsal view, weakly projecting from lateral outline of head; puncturation coarse and sparse, irregularly spaced, slightly denser and smaller in lateral than that in central dorsal area interstices wider than diameter of punctures both in lateral and median dorsal area; pubescence black and sparse. Antennae 1.82-1.98 mm long; antennomere III distinctly longer than II, approximately 1.5-1.6 times as long as II, antennomeres IV-VI longer than the width, antennomeres VII-X about as wide as long; antennomere XI almost twice as long as wide.

Pronotum oblong, approximately 1.2 times as long as wide and as wide as head (Figs 1a-b), slightly narrowed posteriorly, with subparallel lateral margins in dorsal view; dorsal surface without pronounced impressions; punctation similar to that of head, but slightly denser; microsculpture absent; pubescence blackish and sparse.

Elytra slightly wider than pronotum, approximately 1.05-1.10 times as wide as pronotum (Figs 1a-b) and shorter than pronotum, at suture about 0.75-0.80 times as long as pronotum; punctation not granulose, smaller, well-defined and denser than that of pronotum and head; microsculpture absent; pubescence reddish, slightly more distinct than that of head and pronotum. Hind wings reduced. Tarsi relatively long (Fig. 1a).

Abdomen slightly wider than elytra, approximately 1.05 times as wide as elytra (Fig. 1a), widest at segment VI; puncturation moderately dense and well-defined; all tergites with distinct microsculpture, composed of dense and fine transverse meshes and striae; pubescence blackish and sparse; posterior margin of tergite VII without palisade fringe.

♂. Sternite VII weakly modified, pubescence unmodified, with concave posterior margin and weakly

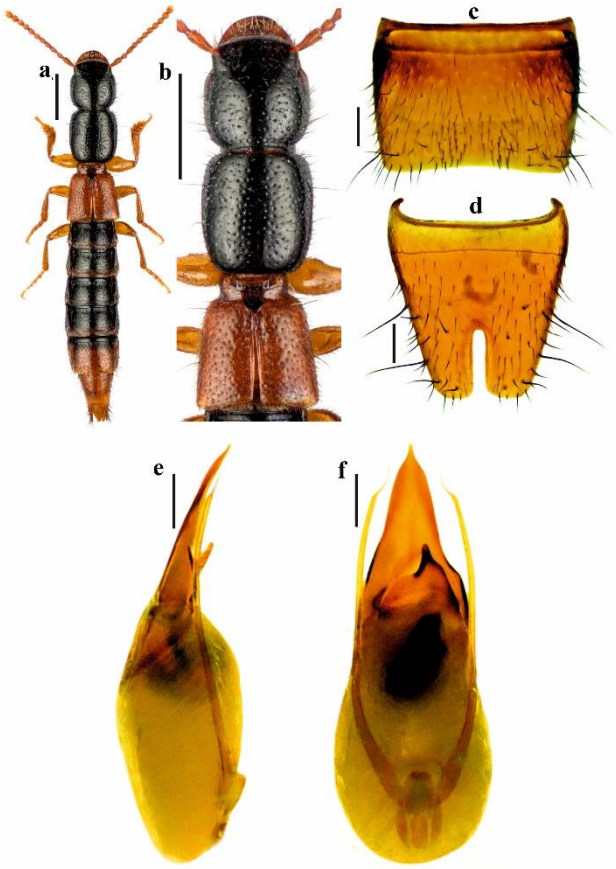

Fig. 1. Some morphological details of *Leptobium orgeli* sp. n. **a.** habitus, **b.** forebody, **c.** male sternite VII, **d.** male sternite VIII, **e.** aedeagus, lateral view, **f.** aedeagus, ventral view. Scale bars: 1 mm (a-b); 0.2 mm (c-f).

depressed in posterior median area (Fig. 1c); sternite VIII with posterior incision not reaching middle of the sternite, little more than 1/3 the length of the sternite (Fig. 1d); aedeagus approximately 1.5-1.6 mm long (Figs 1e-f), dorsal plate of aedeagus long and slender, apically acute; the shape of the ventral process oblong and asymmetrical and on the right elongated in ventral view.

Comparative notes: The new species can be distinguished from other congeners (*Leptobium angoranum* Anlaş & Örgel, 2020; *L. ilgazicum* Assing, 2010; *L. ponticum* Assing, 2005; *L. yagmuri* Anlaş, 2017) in central northern Anatolia by the completely different morphology of the aedeagus and by the larger body (*L. angoranum*: 4.7-5.1 mm; *L. ilgazicum*: 6.6-7.0 mm; *L. ponticum*: 6.0-7.3 mm; *L. yagmuri*: 5.1-6.3 mm). External characters of the new species are similar to *L. illyricum* (Erichson, 1840), thus a reliable separation of the two species is possible only based on an examination of the aedeagus, especially the differently shaped ventral process. The species can be distinguished from *L. illyricum* by the more slender and pointed ventral process in ventral view.

For descriptions and illustrations of *L. angoranum*, *L. ilgazicum*, *L. ponticum*, *L. yagmuri* and *L. illyricum* see Assing (2005, 2010b), Anlaş (2017) and Anlaş & Örgel (2020).

Remarks: Leptobium illyricum is known from Albania, Bosnia Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Slovenia, Cyprus, Iran, Syria and Türkiye (Assing 2005, Schülke & Smetana, 2015). *Leptobium illyricum* is distributed in Türkiye in Antalya, Konya and Mersin provinces. It seems that this species is confined to southern Anatolia (Assing 2005: fig. 116). The species has also been recorded from Amasya (=Çorum) province in northern Anatolia (Amasya: 1 ex., 10 km N Mecitözü, 1000 m, 4.V.1987, leg. Giachino) by Assing (2009b). Thus, this species was recorded far outside of its known distribution, so this record seems doubtful. This record is situated 70 km to the south of the type locality of *L. orgeli* sp. n. (Fig. 2). The record from Çorum by Assing (2009b) most probably refers to the new species.

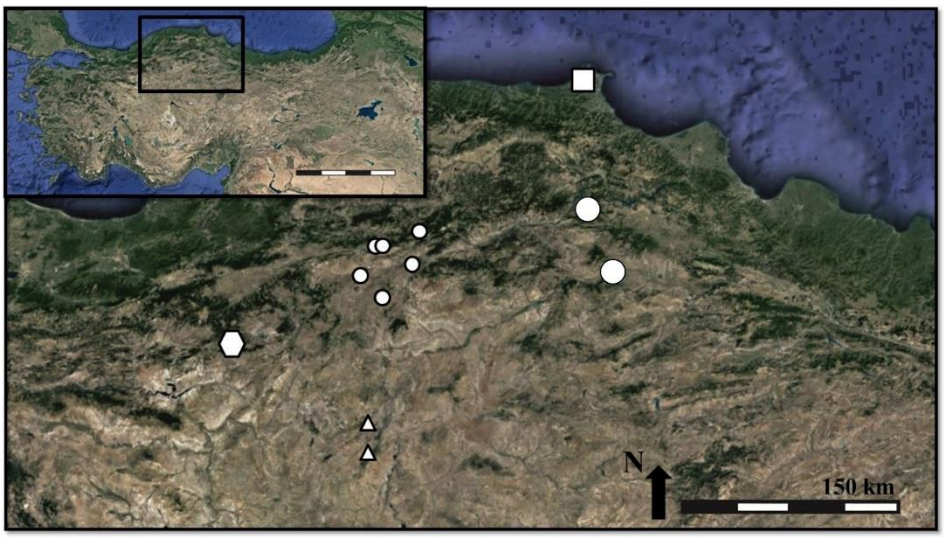

Fig. 2. Distribution map for the endemic *Leptobium* species in central northern Anatolia: *L. ilgazicum* Assing (small circles); *L. ponticum* Assing (square); *L. yagmuri* Anlaş (small triangles), *L. angoranum* Anlaş & Örgel (hexagon), *L. orgeli* sp. n (large circles).

Etymology: The species is dedicated to Semih Örgel, Manisa, who collected some of the type specimens of the new species.

Distribution and bionomics: The species was found at four localities from Çorum (Osmancık, Danişment) (Fig. 2, Table 1). The type specimens were collected under stones in various grassland areas at altitudes of 1400-1490 m.

Faunistic Records

Leptobium carinatum Assing, 2005

Material examined: TÜRKİYE: 1♂, 2♀♀, 29.IV.2016, Antalya, Finike, Dağbağ, 36°25'19"N, 29°53'59"E, 336 m, leg. Kunt (AZMM). 1♂, 27.IV.2016, Antalya, Kaş, Saklıkent, 36°23'07"N, 29°21'02"E, 300 m, leg. Kunt (AZMM).

Distribution: This species is confined to Antalya and Muğla provinces in southwestern Türkiye (Assing 2005, Anlaş & Örgel 2021), (Table 1).

Leptobium densiventre (Fauvel, 1875)

Material examined: ALGERIA: 1♂, Algeria, Tlemcem (=Tlemcen), *Dolicaon illyricus* Peyer. (MNHNP). 1♂, Ain Fezza (MNHNP). TUNUSIA: 1♂, 1♀, Tunusie, Mateur, leg. Roche, *Leptobium boiteli* det. Fagel. (IRSNB).

Distribution: According to Assing (2005), *Leptobium densiventre* is widespread in northwest Africa, from Algeria to Libya and Sicily. The species was also recorded from Italian mainland recently by Anlaş (2017).

Leptobium fagniezi Jarrige, 1952

Material examined: ALGERIA: 1♂, 18.V.1953, Gde Kabylie (=Grande Kabylie, Yakouren), Foret d'Alfadou, Tala Kitan, 1100 m, leg. Fagel (IRSNB).

Distribution: This species is known from northern Algeria (Assing 2005).

Leptobium gracile (Gravenhorst, 1802)

Material examined: TÜRKİYE: 3♂♂, 6♀♀, 10.III.2018, Ankara, Mamak, Kutludüğün Plateau, 39°52'11"N, 33°06'04"E, 1436 m, leg. Örgel & Yaman (AZMM). 2♂♂, 4♀♀, 11.III.2018, Ayaş 10 km SE, Abdülselam Mountain, 39°56'40"N, 32°22'25"E, 1414 m, leg. Örgel & Yaman (AZMM). 4♂♂, 6♀♀, 21.V.2018, Çankırı, Ilgaz, Kuyupınar 2 km E, 1414 m, 40°51'06"N, 33°37'37"E, leg. Örgel & Yaman (AZMM). 8♂♂, 7♀♀, 30.X.2017, Karaman, Ayrancı, Yüğlük Hill, 37°00'49"N, 33°46'55"E, 1967 m, leg. Örgel & Yaman (AZMM). 2♂♂, 3♀♀, 03.V.2018, Karaman, Ayrancı, Yüğlük Hill, 37°00'49"N, 33°46'55"E, 1967 m, leg. Örgel & Yaman (AZMM). 8♂♂, 7♀♀, 02.V.2018, Karaman, Ermenek, Balkusan, 1890 m, 36°48'43"N, 32°53'35"E, leg. Örgel & Yaman (AZMM). 1♂, 09.IV.2018, Kayseri, Akkışla, Gömürgen 7 km E, Hınzır Dağları, 1970 m, 39°01'19"N, 36°17'52"E, 1970 m, leg. Yağmur & Örgel, Yaman (AZMM). 1♂, 07.V.2018, Kayseri, Develi, Yaylacık 6 km S, 38°04'26"N, 35°45'27"E, 1735 m, leg. Örgel & Yaman (AZMM). 3♂♂, 5♀♀, 07.III.2018, Kırıkkale, Bahşili, Sarıkayalar 8 km N, 39°44'12"N, 33°17'13"E, 1310 m, leg. Örgel & Yaman (AZMM). 2♂♂, 1♀, 08.III.2018, Kırıkkale, Çelebi, Tilkili 3 km E, 39°33'12"N, 33°30'41"E, 1427 m, leg. Örgel & Yaman (AZMM). Konya, 1♂, 27.X.2017, Bozkır, Tanrıdağı Tepesi, 36°58'39"N, 32°16'15"E, 1892 m, leg. Örgel & Yaman (AZMM). 2♂♂, 1♀, 05.III.2018, Konya, Cihanbeyli, Kırkışla, 38°32'10"N, 32°51'05"E, 1025 m, leg. Örgel & Yaman (AZMM). 2♂♂, 01.III.2018, Konya, Ilgın, Ilgın Gölü, 38°23'25"N, 31°53'21"E, 1068 m, leg. Örgel & Yaman (AZMM). 1♂, 1♀, 03.III.2018, Konya, Karapınar, Meke Lake, leg. Örgel & Yaman (AZMM). 3♂♂, 4♀♀, 05.III.2018, Konya, Böllük Gölü, 38°30'49"N, 32°54'00"E, 990 m, leg. Örgel & Yaman (AZMM). 1♂, 2♀♀, 04.III.2018, Konya, Karapınar, Yeşilyurt, Ovacık Y. 37°45'57"N, 33°46'08"E, 1600 m, leg. Örgel & Yaman (AZMM). 1♂, 1♀, 02.III.2018, Konya, Ilgın, Bulcuk, 38°08'40"N, 31°57'48"E, 1430 m, leg. Örgel & Yaman (AZMM). 1♂, 1♀, 20.III.2018, Konya, Halkapınar, Güney Mountain, 37°26'51"N, 34°18'31"E, 1830 m, leg. Örgel & Yaman (AZMM). 1♂, 09.V.2018, Konya, Karapınar, Meke Lake, 37°41'00"N, 33°38'01"E, 1000 m, leg. Örgel & Yaman (AZMM). 9♂♂, 5♀♀, 30.IV.2018, Konya, Bozkır, Geyik Mountains, 1875 m, 36°58'39"N, 32°04'56"E, leg. Örgel & Yaman (AZMM).

Distribution: Leptobium gracile is known from Canary Islands to Central Asia (Assing 2005, Schülke & Smetana 2015, Anlaş 2017). This species is very common and widespread in Türkiye (Table 1).

Leptobium illyricum (Erichson, 1840)

Material examined: CROATIA: 1♂, V.1927, Dalmatia, leg. Fodor (HNHM). GREECE: 1♂, 1♀, Graecia, leg. Fodor (HNHM).

Distribution: The species is known from Albania, Bosnia Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Slovenia, Cyprus, Iran, Syria and Türkiye (Assing 2005, 2017, Anlaş 2017).

Leptobium izmiricum Anlaş & Gusarov, 2020

Material examined: TÜRKİYE: 2♂♂, 5♀♀, 18.IV.2021, İzmir, Karaburun 6 km W, 38°37'N, 26°24'E, 470 m, leg. Anlaş (AZMM).

Distribution: The recently described *L. izmiricum* is known from Karaburun, Çeşme and Urla districts in İzmir province (Anlaş & Gusarov 2020), (Table 1).

Leptobium mutabile Assing, 2005

Material examined: TÜRKİYE: 1♂, 29.IV.2016, Antalya, Finike, 36°17'34"N, 30°06'36"E, 600 m, leg. Kunt (AZMM). 2♂♂, 29.III.2016, Antalya, Gazipaşa, İnal Village, 36°09'07"N, 32°33'28"E, 1070 m, leg. Kunt (AZMM). 2♂♂, 07.VI.2019, Antalya, Kumluca, Sarnıç Hill, 36°21'24"N, 30°18'03"E, 120 m, leg. Yağmur (AZMM).

Distribution: The species is known only from Antalya province (Assing 2005, Anlaş & Örgel 2021), (Table 1).

Leptobium sparsum (Reitter, 1887)

Material examined: RUSSIA: 1♂, 1♀, 09.V.2017, Krasnodar Krai, [Terr.], vill. Nebug, Nebug riv. valley, 44°11'14"N, 39°01'05"E, mostly moss, leg. Salnitska & Valuyskiy (ZIN).

Distribution: Leptobium sparsum occurs in the western Caucasus region (Assing 2005, Anlaş 2017).

Leptobium syriacum (Saulcy, 1865)

Material examined: TÜRKİYE: 3♂♂, 22.III.2008, Gaziantep, Islahiye, Kabaklar, 840 m, 37°01'56"N, 36°33'44"E, leg. Yağmur (AZMM). 4♂♂, 3♀♀, 08.IV-23.VIII.2017 and 16.VIII.2019, Hatay, Hassa, Küreci, 36°42'32"N, 36°27'03"E, 532 m, leg. Yağmur.

Distribution: Leptobium syriacum is distributed in Cyprus, Israel, Iraq, Lebanon, Syria and Türkiye (Assing 2005, Örgel & Anlaş 2016, Anlaş 2017).

Table 1. Distributional checklist of the *Leptobium* species of Turkey.

Species	Distribution	References
Leptobium angoranum Anlaş & Örgel, 2020	Ankara (Beypazarı)	Anlaş & Örgel (2020); Endemic
Leptobium anlasi Assing, 2009	Manisa	Assing (2009b), Anlaş (2012, 2017); Endemic
Leptobium assingi Bordoni, 1994	Antalya, Gaziantep, Hatay, Kahramanmaraş, Osmaniye	Bordoni (1994), Assing (2005, 2006, 2009a, b, 2017), Anlaş (2017), Anlaş & Örgel (2020); Endemic
Leptobium bicarinatum Assing, 2005	Gaziantep, Hatay, Kilis	Assing (2005, 2009a, b), Anlaş (2012, 2017), Anlaş & Örgel (2020)
Leptobium bozdagense Assing, 2006	İzmir, Manisa	Assing (2006, 2009b), Anlaş & Çevık (2008), Anlaş (2012, 2017); Endemic
Leptobium carinatum Assing, 2005	Antalya, Muğla	Assing (2005, 2017), Anlaş (2017), Anlaş & Örgel (2020); Endemic
Leptobium geminum Assing, 2005	Gaziantep, Kilis	Assing (2005); Endemic
Leptobium gracile (Gravenhorst, 1802)	Widespread and common in Turkey	Assing (2005, 2009a, b, 2010a, b, 2017), Anlaş & Çevik (2008), Anlaş (2012, 2017); Örgel & Anlaş (2016), Anlaş & Örgel (2020)
Leptobium ilgazicum Assing, 2010	Çankırı	Assing (2010b), Anlaş (2017), Anlaş & Örgel (2020); Endemic
Leptobium illyricum (Erichson, 1840)	Antalya, Konya, Mersin	Assing (2005, 2009b, 2017), Anlaş (2012)
Leptobium izmiricum Anlaş & Gusarov, 2020	İzmir (Karaburun, Çeşme)	Anlaş & Gusarov (2020); Endemic
Leptobium keskini Anlaş & Gusarov, 2020	Balıkesir (Sındırgı, Ulus Dağı)	Anlaş & Gusarov (2020); Endemic
Leptobium mutabile Assing, 2005	Antalya	Assing (2005, 2009b), Anlaş (2017), Anlaş & Örgel (2020); Endemic
Leptobium nabozhenkoi Anlaş, 2012	Karaman (Bolkar Dağı)	Anlaş (2012); Endemic
Leptobium orgeli Anlaş sp. n.	Çorum (Osmancık)	Anlaş (present paper); Endemic
Leptobium ponticum Assing, 2005	Sinop	Assing (2005, 2009a), Anlaş (2012, 2017), Anlaş & Örgel (2020); Endemic
Leptobium schuelkei Assing, 2005	Hatay	Assing (2005), Anlaş (2012); Endemic
Leptobium syriacum (Saulcy, 1865)	Adana, Diyarbakır, Gaziantep, Hatay, Kahramanmaraş, Kilis, Mersin, Osmaniye, Şırnak	Jarrige (1952), Coiffait (1972, 1982), Assing (2005, 2006, 2009a, b, 2017), Anlaş (2012, 2017)
Leptobium thracicum Anlaş & Örgel 2021	Tekirdağ (Şarköy, Uçmakdere)	Anlaş & Örgel (2021); Endemic
Leptobium wunderlei Bordoni, 1994	Antalya, Mersin (Anamur)	Bordoni (1994), Assing (2005, 2009b, 2010a, 2017), Anlaş (2012); Endemic
Leptobium yagmuri Anlaş, 2017	Ankara, Kırıkkale	Anlaş (2017), Anlaş & Örgel (2020) Yaman *et al.* (2020); Endemic

Discussion

The main center of diversity of the genus *Leptobium* is in the Mediterranean countries and adjacent regions, especially Türkiye. 21 species of the genus have been recorded so far from Türkiye, where only five species were known before 2005 (Table 1). Despite the fact that the Turkish fauna of the genus has been well-studied in recent years, it seems most likely that the diversity of *Leptobium* species in Türkiye is far greater than presently known. Because, many species remain to be discovered and described. The main reason for the situation is that some regions of Türkiye (e. g. northeastern, eastern and southeastern Anatolia) have not been sufficiently studied in terms of *Leptobium* fauna yet.

The most distinctive specialty of the *Leptobium* fauna of Türkiye is the high rate of endemism. In Türkiye, 17 of 21 species are endemic and the endemism rate represent more than 80% of the Turkish *Leptobium* fauna. Restricted distribution ranges and the strong link to specific geological substrates are important characteristics of the endemic fauna of Türkiye (Çıplak *et al.* 1992, Demirsoy 2007). Endemic species in Türkiye are distributed in southern Anatolia (seven species), northern and central northern Anatolia (five species), western Anatolia (four species) and Thrace Region (one species). It is thought that both the number of species and endemic species will increase in the future, with further detailed studies on the *Leptobium* fauna of Türkiye.

Acknowledgement

I am most grateful to Semih Örgel, Ersen Aydın Yağmur, Enes Zafer Kacar, Mutlu Çelik (Manisa, TÜRKİYE) and Kadir Buğaç Kunt (Bursa, TÜRKİYE) for making their staphylinid collections available for this study.

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Conflict of Interest: The author haS no conflicts of interest to declare.

Funding: This study was partly supported by the Scientific and Technological Research Council of Türkiye (TUBITAK project numbers 119Z253 and 215Z080).

References

1. Anlaş, S. 2012. A new species and additional records of the genus *Leptobium* Casey from Turkey (Coleoptera: Staphylinidae: Paederinae). *Turkish Journal of Entomology* 36: 225-230.
2. Anlaş, S. 2017. A new species and new country records for the genus *Leptobium* Casey in the Palaearctic Region (Coleoptera: Staphylinidae: Paederinae). *Zootaxa*, 4338: 173-181.
3. Anlaş, S. & Çevik, I. E. 2008. Faunistic studies on the species of Paederinae (Coleoptera: Staphylinidae) in Manisa, Turkey. *Munis Entomology & Zoology* 3: 665-674.
4. Anlaş, S. & Gusarov, V. I. 2020. Two new species of the genus *Leptobium* Casey from Western Anatolia, Turkey (Coleoptera: Staphylinidae: Paederinae). *Journal of Insect Biodiversity*, 14: 40-46.
5. Anlaş, S. & Örgel, S. 2020. New species and additional records of the genus *Leptobium* Casey (Coleoptera: Staphylinidae: Paederinae) from Central Anatolia. *Journal of the Entomological Research Society*, 22(1): 101-105.
6. Anlaş, S. & Örgel, S. 2021. *Leptobium thracicum* sp. n. (Coleoptera: Staphylinidae: Paederinae) from Thrace Region of Turkey and additional records for the genus. *Turkish Journal of Entomology*, 45: 397-402.
7. Assing, V. 2005. A revision of the genus *Leptobium* Casey (Coleoptera: Staphylinidae: Paederinae). *Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie)*, 673: 1-182.
8. Assing, V. 2006. A revision of *Leptobium* Casey Supplement I (Insecta: Coleoptera: Staphylinidae, Paederinae). *Linzer biologische Beiträge*, 38: 381-384.
9. Assing, V. 2009a. A revision of *Leptobium* Casey. III. A new species from Iran and additional records (Coleoptera: Staphylinidae: Paederinae). *Linzer biologische Beiträge*, 41: 1247-1252.
10. Assing, V. 2009b. A revision of *Leptobium* Casey. IV. Three new species and additional records (Coleoptera: Staphylinidae: Paederinae). *Stuttgarter Beiträge zur Naturkunde Serie A, Neue Serie*, 2: 227-236.
11. Assing, V. 2010a. A revision of *Leptobium* Casey. VI. A revalidation, a new synonymy, and additional records (Coleoptera: Staphylinidae: Paederinae). *Linzer biologische Beiträge*, 42: 499-506.
12. Assing, V. 2010b. A revision of *Leptobium* Casey. VII. Two new species from Turkey and Spain, and additional records (Coleoptera: Staphylinidae: Paederinae). *Linzer biologische Beiträge*, 42: 1037-1043.
13. Assing, V. 2017. A revision of *Leptobium* Casey. VIII. A new species from Iran, a new synonymy, and additional records (Coleoptera: Staphylinidae: Paederinae). *Linzer biologische Beiträge*, 49: 275-284.
14. Bordoni, A. 1994. Nuove specie di Staphylinidae della regione mediterranea (Coleoptera). *Redia*, 77: 23-32.
15. Coiffait, H. 1972. Paederinae nouveaux ou mal connus de la région paléarctique occidentale. *Nouvelle Revue d'Entomologie*, 2: 131-150.
16. Coiffait, H. 1982. Coléoptères Staphylinidae de la région paléarctique occidentale. IV. Sous famille Paederinae. Tribu Paederini 1 (Paederi, Lathrobii). *Nouvelle Revue d'Entomologie*, 12: 1-440.
17. Çıplak, B., Demirsoy, A. & Bozcuk, A. N. 1992. Türkiye tettigoniidlerinin Anadolu Diagonaline gore yayılışları ve hareket yeteneği ile ilişkisi. *In: Uygun, N. (Ed.),* Proceedings of the Second Turkish National Congress of Entomology, 28–31 January 1992, Adana, Turkey. Entomological Society of Turkey and Çukurova University, Agricultural Faculty, Department of Plant Protection, Adana, Turkey, pp. 373–385. (In Turkish).

18. Demirsoy, A. 2007. *Genel ve Türkiye Zoocoğrafyası: Hayvan Coğrafyası*. 2nd edn. Meteksan press, Ankara, Turkey, 1024 pp. (In Turkish).

19. Jarrige, J. 1952. Brachelytres nouveaux ou mal connus de la faune circamediterraneenne. *Annales de la Societe Entomologique de France*, 119: 117-139.

20. Örgel, S. & Anlaş, S. 2016. Faunistic studies on the subfamily Paederinae (Coleoptera: Staphylinidae) in Uşak Province, Western Anatolia. *Acta Biologica Turcica*, 29: 61-66.

21. Schülke, M. & Smetana, A. 2015. Staphylinidae, pp. 304-1134. In: Löbl, I. & Löbl, D. (eds). *Catalogue of Palaearctic Coleoptera*. *Volume 2. Hydrophiloidea - Staphylinoidea*. Revised and updated edition. Leiden, Brill, 942 pp.

22. Yaman, S., Şenyüz, Y. & Anlaş, S. 2020. Contributions to the Paederinae (Staphylinidae) fauna of Kırıkkale province in Central Anatolia. *KSU Journal of Agriculture and Nature*, 23: 1326-1330.

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S31-S39, 2022
SSN 2528-9691
DOI: 10.23902/trkjnat.1113991

Research Article
Special Issue: Biodiversity of Insects

CONTRIBUTIONS TO THE BLACKFLY FAUNA (DIPTERA, SIMULIIDAE) OF TÜRKİYE WITH A NEW RECORD FROM THE WESTERN BLACK SEA REGION

Ebru Ceren FİDAN*, Ümit ŞİRİN

Biology Department, Science and Letter Faculty, Eskişehir Osmangazi University, 26048 Meşelik, Eskişehir, TÜRKİYE

Cite this article as:

Fidan E.C. & Şirin Ü. 2022. Contributions to the Blackfly fauna (Diptera, Simuliidae) of Türkiye with a new record from the western Black Sea region. *Trakya Univ J Nat Sci*, 23(Special Issue): S31-S39, DOI: 10.23902/trkjnat.1113991

Received: 08 May 2022, Accepted: 14 July 2022, Online First: 17 July 2022, Published: 20 July 2022

Edited by:
Kadri Kıran

Corresponding Author:
Ebru Ceren Fidan
ebruceren@ogu.edu.tr

ORCID iDs of the authors:
ECF. orcid.org/0000-0002-6121-4585
ÜF. orcid.org/0000-0001-7327-4043

Key words:
New records
Simulium
Prosimulium
Anatolian Peninsula

Abstract: Despite the rich biodiversity potential of Anatolia, the blackfly fauna of Türkiye has not been fully explored. In the present study, a sampling study for blackflies were performed in Western Black Sea Region in spring seasons from 2016 to 2018 and 15 blackfly species from 73 different lotic habitats have been reported. *Simulium (Nevermannia) carthusiense* Grenier & Dorier, 1959 is new for Turkish fauna. Ten species have been recorded from the region for the first time. Distributional remarks in Türkiye and the world are given along with brief taxonomic evaluations for each species.

Özet: Anadolu'nun zengin biyolojik çeşitlilik potansiyeline rağmen, Türkiye'nin siyah sivrisinek faunası henüz tam olarak keşfedilmemiştir. Bu çalışmada Batı Karadeniz Bölgesi'ndeki 73 farklı sucul habitattan 15 siyah sivrisinek türü rapor edilmektedir. Tespit edilen türlerden 10 tanesi çalışma bölgesinden ilk kez kaydedilmektedir ve *Simulium (Nevermannia) carthusiense* Grenier & Dorier, 1959 türü ise Türkiye için yeni kayıttır. Çalışma materyali bölgeden 2016 ve 2018 yılları arasında çoğunlukla bahar aylarında toplanmıştır. Her tür için kısa taksonomik değerlendirmelerle birlikte hem Türkiye'deki hem de Dünya'daki dağılımları verilmiştir.

Introduction

Blackflies (Diptera: Simuliidae) are small, black and inconspicuous nuisance flies which are important vectors of many organisms that cause diseases such as leucocytozoonosis and onchocerciasis (river blindness) all over the world (Adler *et al.* 2004). Rheophilic preadults inhabit various running waters (rivers, springs, etc.) and form the link in the trophic web between their predators and nutrients (Crosskey 1990). Adult (male and females) blackflies generally feed on nectars of flowering plants. Females of many species also have blood-sucking behavior. Such species can be defined as anthropophilic, ornithophilic or mammophilic based on this behaviour. Blood-sucking species are involved in the spread of many pathogens and parasites, such as viruses, protozoans and filarial worms. In addition, attacks of some blackfly species cause severe allergic reactions in humans and livestock (Adler *et al*. 2004). In order to solve and prevent the problems caused by these flies, it is necessary to know the species living in each region or country.

In the latest revision of the world blackfly inventory, the family is represented by 2,415 species (2,398 recent and 17 fossil species) throughout the world, of which 57 species are recorded in Türkiye (Adler 2022). Although the first information about blackflies in Anatolia was published by Austen (1925), Türkiye's blackfly fauna was neglected until the 1990s. Since then, many authors studied Simuliidae Fauna in Türkiye; Kazancı & Clergue-Gazeau (1990), Şirin & Şahin (2005), Crosskey & Zwick (2007), Çağlar & İpekdal (2009), Şirin *et al.* (2014, 2015), Şirin & Adler (2015), Başören & Kazancı (2016, 2020, 2021), Gazyağcı & Aydenizöz (2019), Onder *et al.* (2019), Özel *et al*. (2019), Fidan (2020) and Aslan (2021).

The number of blackfly species known from Türkiye corresponds to approximately 9% of the Palearctic fauna. Considering the environmental heterogeneity in Türkiye, it is highly probable that there are much more species (Çağlar & İpekdal 2009). So, faunistic studies are important to reveal the exact number of Simuliidae species in Türkiye.

Crosskey & Zwick (2007) recorded 9 black fly species so far in the Western Black Sea region only from Bolu province.

The aim of this study is to complete the list of Simuliidae species of the Western Black See Region of Türkiye.

Materials and Methods

Blackfly specimens were collected from 73 different lotic habitats in the Western Black Sea Region between 2016 and 2018. Preadult stages (larva and pupa) were found together in various types of natural flowing waters. All the specimens were gathered by forceps from the rocks, leaves and other substrates in the streams and directly fixed and preserved in 80% ethanol for taxonomical studies. Adults emerged from pharate pupae. The collecting sites are shown on a map created using Google Earth application (Fig. 1). The, province, locality, coordinates, altitudes and date of collecting sites are given in Table 1. The region includes the provinces of Zonguldak, Karabük, Bartın, Kastamonu, Çankırı, Sinop, Samsun, Tokat, Çorum and Amasya provinces, with an area of 74,178 km^2, constituting 9.5% of Türkiye's surface area (Kuşvuran *et al.* 2011).

The material is deposited in the Entomology Laboratory of Eskişehir Osmangazi University, Eskişehir, Türkiye. The material was investigated using a stereomicroscope (Leica MZ 16) Following relevant publications (Rubtsov 1956, Knoz 1965, Terteryan 1968, Crosskey 1990, 1998, 2002, Bass 1998, Crosskey & Malicky 2001, Yankovsky 2003, Crosskey & Zwick 2007). The nomenclature follows Adler (2022).

Table 1. Detailed information of the collecting sites.

Loc.no	Province	Locality	Coordinate	Altitude	Date
1	Bolu	Bostancılar Vill.	40°23.828 N, 31°11.394 E	1010 m	9.06.2016
2	Bolu	Cepni Vill.	40°34.027 N, 31°15.256 E	948 m	9.06.2016
3	Bolu	Abant exit	40°37.475 N, 31°18.555 E	1140 m	9.06.2016
4	Bolu	Dereceören Stream	40°38.932 N, 31°22.296 E	967 m	9.06.2016
5	Bolu	Bürnük Stream	40°44.016 N, 31°48.208 E	810 m	10.06.2016
6	Bolu	Yeniçağa Stream	40°46.263 N, 31°59.259 E	999 m	10.06.2016
7	Bolu	Yumrutaş Stream	40°52.750 N, 32°05.488 E	707 m	10.06.2016
8	Bolu	Çubuk Stream	41°03.096 N, 32°04.380 E	604 m	10.06.2016
9	Zonguldak	ÖzpınarStream	41°09.507 N, 31°53.748 E	137 m	10.06.2016
10	Zonguldak	Sabunlar Stream	41°07.467 N, 31°53.267 E	41 m	10.06.2016
11	Zonguldak	Örmece Stream	41°19.472 N, 32°03.070 E	63 m	10.06.2016
12	Zonguldak	Beycuma Stream	41°20.843 N, 31°58.017 E	230 m	10.06.2016
13	Zonguldak	Torlaklar Stream	41°29.599 N, 32°06.673 E	26 m	10.06.2016
14	Bartın	Bartın Stream	41°31.255 N, 32°20.968 E	41 m	10.06.2016
15	Bartın	Karaçay Stream	41°39.348 N, 32°21.381 E	20 m	10.06.2016
16	Bartın	Gökırmak River	41°32.397 N, 32°26.349 E	50 m	11.06.2016
17	Bartın	Gökırmak River 2	41°31.329 N, 32°30.856 E	89 m	11.06.2016
18	Bartın	Çanakçar Stream	41°29.632 N, 32°35.397 E	162 m	11.06.2016
19	Karabük	Ovacuma Stream	41°26.326 N,32°45.290 E	372 m	11.06.2016
20	Karabük	Cumayanı Stream	41°05.939 N, 32°40.346 E	372 m	11.06.2016
21	Karabük	Karahasanlar Stream	40°59.552 N, 32°35.587 E	600 m	11.06.2016
22	Karabük	Iğdir Stream	41°13.382 N, 33°08.386 E	542 m	11.06.2016
23	Kastamonu	Kışla Stream	41°13.289 N, 33°09.621 E	551 m	11.06.2016
24	Kastamonu	Zala Stream	41°14.008 N, 33°18.483 E	644 m	11.06.2016
25	Kastamonu	Ortaköy Stream	41°18.281 N, 33°35.489 E	1043 m	11.06.2016
26	Kastamonu	Daday Stream	41°26.524 N, 33°47.789 E	719 m	12.06.2016
27	Kastamonu	Örcünler Stream	41°37.687 N, 33°42.889 E	1026 m	12.06.2016
28	Kastamonu	KurudereStream	41°28.896 N, 34°04.430 E	613 m	12.06.2016
29	Kastamonu	Taşköprü Stream	41°32.268 N, 34°13.554 E	553 m	12.06.2016
30	Kastamonu	KıvrımçayStream	41°35.925 N, 34°19.541 E	516 m	12.06.2016
31	Kastamonu	Gökçeağaç Stream	41°37.521 N, 34°30.569 E	410 m	12.06.2016
32	Sinop	30 km (N) to Gerze	41°42.040 N, 34°54.873 E	702 m	12.06.2016
33	Sinop	Kırcalı Stream	41°54.240 N, 34°58.600 E	105 m	12.06.2016
34	Sinop	Karasu Stream	41°53.578 N, 34°55.630 E	143 m	12.06.2016
35	Sinop	Asarak Stream	41°21.906 N, 34°49.159 E	389 m	13.06.2016
36	Sinop	Çalpınar Stream	41°17.010 N, 34°39.585 E	760 m	13.06.2016
37	Kastamonu	Devrez Stream	41°02.356 N, 34°13.798 E	472 m	13.06.2016
38	Kastamonu	Akbük Stream	40°57.088 N, 33°55.424 E	692 m	13.06.2016
39	Düzce	Melen Stream	41°03.027 N, 30°57.361 E	15 m	6.05.2017
40	Düzce	Kalkın Stream	41°03.184 N, 31°02.538 E	64 m	6.05.2017
41	Düzce	Tahirli Stream	41°03.307 N, 31°04.051 E	132 m	6.05.2017
42	Düzce	Boğaziçi Stream	40°56.400 N, 31°09.576 E	236 m	6.05.2017
43	Düzce	Melen Stream	40°56.362 N, 31°24.033 E	305 m	6.05.2017
44	Karabük	Şeker Stream	41°13.374 N, 32°10.569 E	266 m	7.05.2017
45	Zonguldak	Filyos Stream	41°18.199 N, 32°07.340 E	56 m	7.05.2017
46	Zonguldak	Perşembe Stream	41°24.306 N, 32°06.252 E	29 m	7.05.2017
47	Zonguldak	Terziler Stream	41°26.142 N, 32°13.586 E	43 m	7.05.2017

Table 1. Continued.

48	Bartın	İnpiri Stream	41°44.141 N, 32°26.115 E	131 m	7.05.2017
49	Bartın	Karaman Stream	41°49.128 N, 32°37.375 E	225 m	7.05.2017
50	Kastamonu	A. Şenpazar Stream	41°47.129 N, 33°12.305 E	342 m	7.05.2017
51	Kastamonu	Valay Stream	41°49.325 N, 33°18.367 E	469 m	7.05.2017
52	Kastamonu	Dereli tekke Stream	41°46.247 N, 33°27.176 E	758 m	7.05.2017
53	Kastamonu	Kızkayası Stream	41°44.010 N, 33°30.143 E	1002 m	7.05.2017
54	Kastamonu	Azdavay Stream	41°38.342 N, 33°18.380 E	847 m	7.05.2017
55	Kastamonu	Bereketli Stream	41°41.378 N, 33°29.303 E	1072 m	7.05.2017
56	Kastamonu	Seydiler Stream	41°37.024 N, 33°43.161 E	1041 m	7.05.2017
57	Kastamonu	Göçen Stream	41°27.244 N, 33°41.390 E	757 m	8.05.2017
58	Kastamonu	Afurözü Stream	41°28.496 N, 33°34.367 E	824 m	8.05.2017
59	Kastamonu	Sarımsakcı Stream	41°28.544 N, 33°30.143 E	862 m	8.05.2017
60	Kastamonu	Oylak Stream	41°31.412 N, 33°46.143 E	974 m	8.05.2017
61	Kastamonu	Küre Stream	41°48.521 N, 33°42.481 E	821 m	8.05.2017
62	Kastamonu	Küre Stream 2	41°52.495 N, 33°42.382 E	913 m	8.05.2017
63	Kastamonu	Camili Stream	41°44.408 N, 33°41.011 E	1134 m	8.05.2017
64	Kastamonu	Devrekani Stream	41°37.187 N, 33°51.043 E	1062 m	8.05.2017
65	Kastamonu	Hacı Hasan Stream	41°42.413 N, 33°58.573 E	1217 m	8.05.2017
66	Kastamonu	Çatalzeytin Stream	41°56.594 N, 34°13.367 E	16 m	8.05.2017
67	Sinop	Gündoğdu Stream	41°56.260 N, 34°18.400 E	17 m	8.05.2017
68	Sinop	Taçahmet Stream	41°56.124 N, 34°24.241 E	30 m	8.05.2017
69	Sinop	Ömerdüz Stream	41°52.360 N, 34°31.116 E	350 m	8.05.2017
70	Sinop	Oluza Stream	41°56.405 N, 34°41.397 E	9 m	8.05.2017
71	Sinop	Sarımsaklı Stream	41°49.510 N, 35°08.380 E	30 m	9.05.2017
72	Kastamonu	Tunnel	41°12.479 N, 33°48.177 E	1007 m	30.04.2018
73	Sinop	Maruf Stream	41°33.313 N, 34°47.359 E	404 m	30.04.2018

Fig. 1. Map of the collecting sites of blackflies in Western Black Sea Region (Numbers on the map refer to the localities which are presented in Table 1); the red outline on the inset map indicates the borders of the studied area.

Results

A total of 14 species of the genus *Simulium* Latreille, 1802 belonging to 4 different subgenera (*Wilhelmia* Enderlein, 1921, *Nevermannia* Enderlein, 1921, *Eusimulium* Roubaud, 1906, and *Simulium* Latreille, 1802) and one species of the genus *Prosimulium* Roubaud, 1906 were recorded [1,515 larvae, 1,785 pupae, 22 adults (16 female and 6 male)]. The list of the species is provided below with the examined material, distributional data and brief taxonomical notes for each species.

Genus *Prosimulium* Roubaud, 1906

Prosimulium rachiliense Djafarov, 1954

Material examined: **(50)** 1 pupa; **(52)** 2 pupae; **(53)** 6 larvae, 6 pupae; **(54)** 9 pupae; **(55)** 88 larvae, 5 pupae; **(56)** 4 larvae, 16 pupae; **(63)** 109 larvae, 67 pupae; **(65)** 85 larvae, 11 pupae; **(72)** 15 larvae, 1 pupa.

Distribution in World: Azerbaijan; Armenia, Bulgaria, Georgia, Greece, Morocco, Romania, Russia (Caucasus), Türkiye (Adler 2022).

Distribution in Türkiye: Ceyhan River Basin, Fırat River Basin, Göksu River Basin, Kızılırmak River Basin, Sakarya River Basin (Başören & Kazancı, 2016); Akşehir, Antalya, Aydın, Balıkesir, Bilecik Bayburt, Bursa, Çanakkale, Çorum, Denizli, Edirne, Eskişehir, Erzincan, Isparta, Kars, Kastamonu, Kayseri, Kırklareli, Kütahya, Muğla, Sivas, Yozgat, (Aslan 2021).

Remarks: Crosskey & Zwick (2007) recorded this species from Bolu province. This species is a new record for the remaining provinces of the study area. *Prosimulium rachiliense* also occurs mainly in Caucasia, Transcaucasia and the Balkan countries including the island of Rhodes. We identified our material as *P. rachiliense* using the illustrations and descriptions of *P. pronevitshae*, Rubtsov, 1955 which was synonymized with *P. rachiliense* by Crosskey & Howard (2004), in Terteryan (1968).

Genus *Simulium* Latreille, 1802

Simulium (Eusimulium) petricolum (Rivosecchi, 1963)

Material examined: (15) 6 pupae; **(18)** 7 pupae; **(71)** 4 larvae, 17 pupae.

Distribution in World: Algeria, Armenia, Austria, Bosnia and Herzegovina, Great Britain, Cyprus, Czech Republic, France, Greece, Ireland, Italy, Libya, Madeira, Morocco, Portugal, Serbia, Spain, Türkiye, Russia (Adler 2022).

Distribution in Türkiye: Afyon (Kalafat & Şirin 2011); Bilecik, Bursa, Kocaeli, Sakarya (Şirin *et al*. 2014).

Remarks: *Simulium petricolum* (Rivosecchi, 1963) can be distinguished from the other species of the *aureum*-species group by the blade-like structure of the ventral plate in the male genitalia and the projection of the anterior corner of the gonocoxite (Crosskey & Malicky 2001). In our material, there were three mature male pupae and their genitalia fit to the description.

Simulium (Nevermannia) carthusiense Grenier & Dorier, 1959

Material examined: **(18)** 2 pupae; **(25)** 13 larvae.

Distribution in World: Andorra, Austria, Czech Republic, France (incl. Corsica), Germany, Italy, Morocco, Poland, Slovakia, Spain, Switzerland, Ukraine (Adler 2022).

Distribution in Türkiye: New record for Türkiye.

Remarks: *Simulium carthusiense* is a member of the *vernum* species group, the largest species group in the genus *Simulium*. It is widely distributed generally in both Central and Mediterranean part of Europe (Adler 2022). According to Adler & Seitz (2014), it is the sister species of a clade that includes *S. beltukovae* (Rubtsov, 1956), the *S. cryophilum* complex, and *S. urbanum* Davies, 1966, considering its polytene chromosomal band-sequence. On the other hand, according to the identification keys published by Knoz (1965) and Jedlicka *et al*. (2004), the species is morphologically very similar to *S. brevidens* (Rubtsov, 1956) in the pupal stage. The main taxonomic characters of our material were in the pupal stage (Fig. 2): (1) the anterior dorsal projection of cocoon short and straight-sided, regular (Jedlicka *et al.* 2004); (2) surface of thoracic tubercles polygonal (papulose) (Jedlicka *et al.* 2004); (3) All gill filaments branched in vertical plane (Knoz 1965); (4) Upper and lower gill filament at an acute angle (Knoz 1965, Jedlićka *et al.* 2004).

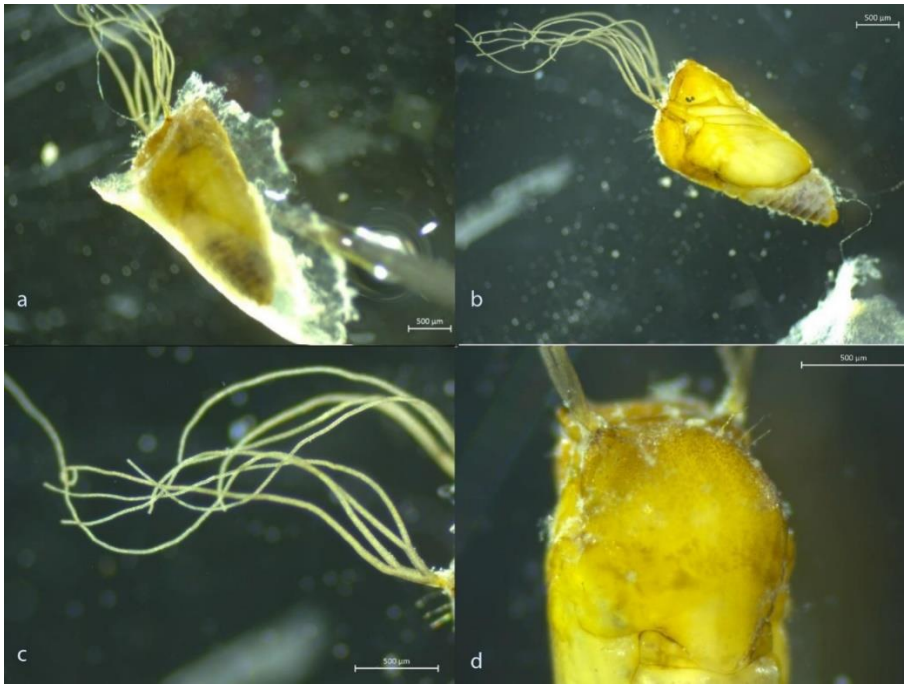

Fig. 2. Pupa of *S. carthusiense*. **a.** pupa and cocoon, lateral view, **b.** pupa, lateral view, **c.** Lateral view of gill respiratory filaments, **d.** thorasic plate with trichomes.

Simulium (Nevermannia) cryophilum (Rubtsov, 1959)

Material examined: **(6)** 1 pupa and 2 larvae.

World Distribution: Algeria, Andorra, Armenia, Austria, Belgium, Bosnia and Herzegovina, Great Britain, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lebanon, Luxembourg, Montenegro, Morocco, The Netherlands, Norway, Poland, Portugal, Russia, Scotland, Serbia, Slovakia, Slovenia, Spain (including Balearic Islands), Sweden, Switzerland, Tunisia, Türkiye, Ukraine (Adler 2022).

Distribution in Türkiye: Büyük Menderes River Basin, Eastern Black Sea Region (Başören & Kazancı 2016); Bilecik, Sakarya, Yalova (Şirin *et al.* 2014).

Remarks: This species, whose existence in Türkiye is known from previous studies, is also a member of the *vernum* group. The main taxonomic characters of the species, according to Bass (1998) and also observed in our material, are as follows: the shape and horizontal branching of the common stems of the pupal gill filaments, and the shape and length of the anterior protrusion of the cocoon and the postgenal cleft of the larva.

Simulium (Simulium) aureofulgens Terteryan, 1949

Material examined: (43) 12 pupae; **(44)** 3 females, 9 larvae, 37 pupae; **(66)** 18 pupae.

World Distribution: Armenia; Azerbaijan, Türkiye (Adler 2022).

Distribution in Türkiye: Kızılırmak River Basin, Sakarya River Basin (Başören & Kazancı 2016).

Remarks: *Simulium aureofulgens*, a species of Caucasian origin, is known to exist in two large river basins, Sakarya and Kızılırmak, close to the study area. Crosskey & Zwick (2007) recorded this species from Bolu province. This species is a new record for the remaining provinces of the study area. The observed larva, pupa and adult characteristics of the specimens examined in the study confirm the descriptions in Terteryan (1968).

Simulium (Simulium) alajense Rubtsov, 1938

Material examined: **(54)** 1 larva, 3 pupae; **(55),** 1 pupa.

World Distribution: Afghanistan, Armenia, Bulgaria, China, India, Iran, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Türkiye, Turkmenistan, Uzbekistan (Adler 2022).

Distribution in Türkiye: Kızılırmak River Basin, Sakarya River Basin (Başören & Kazancı 2016).

Remarks: This species is another member of the *bezzii* group known from Anatolia. According to Yankovsky (2003), it can be distinguished from *Simulium bezzii* (Corti, 1914) by relatively small fenestrations posterior to the cocoon rim and eight gill filaments of the pupae as observed in our material.

Simulium (Simulium) bezzii (Corti, 1914)

Material examined: (1) 3 pupae; **(2)** 1 larva; **(3)** 4 larvae; **(18)** 4 larvae, 4 pupae; **(32)** 1 larva; **(36)** 6 larvae, 4 pupae; **(38)** 10 larvae, 25 pupae; **(54)** pharate adult 1 female, 28 larvae, 55 pupae; **(58)** 122 larvae, 28 pupae; **(59)** 1 pupa; **(60)** 183 larvae, 111 pupae; **(64)** 1 pupa; **(66)** 1 pupa; **(67)** 2 pupae; **(68)** 1 pupa; **(69)** 10 larvae, 2 pupae; **(73)** 1 pupa.

World Distribution: Algeria, Andorra, Armenia, Austria, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, France, Georgia, Germany, Greece, Iran, Iraq, Israel, Lebanon, Macedonia, Morocco, Poland, Romania, Russia, Serbia, Spain, Switzerland, Türkiye, Ukraine, Uzbekistan (Adler 2022).

Distribution in Türkiye: Ceyhan River Basin, Çoruh River Basin, Göksu River Basin, Fırat River Basin, Kızılırmak River Basin Sakarya River Basin, Streams in Eastern Black Sea Region, Yuvarlakçay Stream, Yeşilırmak Stream (Başören & Kazancı 2016); Bursa, Yalova (Şirin *et al.* 2014).

Remarks: *Simulium bezzii* is common and widespread in both Türkiye and the southwestern Palearctic. According to Yankovsky (2003), the species can be distinguished from other "*bezzii* group species" by its distinctive pupal cocoon structure as in our material.

Simulium (Simulium) degrangei Dorier & Grenier, 1960

Material examined: (7) 2 larvae; **(44)** 2 larvae, 28 pupae; **(50)** 1 male, 16 larvae, 29 pupae; **(51)** 5 larvae, 21 pupae; **(52)** 5 females, 3 males, 5 larvae, 178 pupae; **(53)** 9 larvae, 20 pupae; **(54)** 12 pupae; **(66)** 83 pupae.

World Distribution: Austria, Bosnia and Herzegovina, Bulgaria, France, Georgia, Germany, Greece, Italy, Montenegro, Serbia, Slovakia, Switzerland, Ukraine, Türkiye (Adler 2022).

Distribution in Türkiye: Büyük Menderes River Basin (Başören & Kazancı 2016).

Remarks: *Simulium degrangei* is one of the three known species of the "*bukovskii* species group" (Adler 2022). Although Başören & Kazancı (2016) reported that the species exists in the Büyük Menderes basin, Adler (2022) does not include Türkiye among the countries where this species is distributed in the latest version of the world checklist. On the other hand, *Simulium bukovskii* Rubtsov, 1940 another member of the species group, is known from both Anatolia and Turkish Thrace (Şirin *et al.* 2015). The basic morphological characters that can be used to distinguish these two species are pupal cocoon structures and filament branching structures (Yankovsky 2003). Unlike *S. bukovskii*, the cocoon of *S. degrangei* has two spoon-like projections anteriorly above and below its anterior opening. However, there are 4-5 very short common stems at the bases of the gill filaments. The pupal characters of our material confirm these descriptions. On the other hand, Crosskey & Zwick (2007) emphasized the similarity of the two species and that synonymy should be

considered. Therefore, comprehensive phylogenetic studies based on DNA data are needed to reveal the taxonomic status of these two species.

Simulium (Simulium) kiritshenkoi Rubtsov, 1940

Material examined: **(1)** 77 pupae, 75 larvae; **(2)** 2 pupae, 53 larvae; **(4)** 9 larvae, 7 pupae; **(5)** 35 larvae, 20 pupae; **(6)** 2 pupae; **(8)** 1 pupa; **(10)** 2 pupae; **(12)** 6 larvae, 1 pupa; **(15)** 1 pupa; **(18)** 3 larvae, 9 pupae; **(28)** 28 larvae, 5 pupae; **(38)** 26 larvae, 51 pupae; **(41)** 9 pupae; **(44)** 6 larvae, 2 pupae; **(47)** 2 larvae, 8 pupae; **(69)** 14 larvae, 5 pupae; **(70)** 5 pupae; **(71)** 1 larva, 1 pupa.

World Distribution: Iran; Armenia, Azerbaijan, Bulgaria, Cyprus, Georgia, Iraq, Pakistan, Romania, Russia (Caucasus), Tajikistan, Türkiye, Ukraine (Adler 2022).

Distribution in Türkiye: Marmara River Basin (Şirin *et al.* 2014); Büyük Menderes River Basin, Ceyhan River Basin, Fırat River Basin, Kızılırmak River Basin, Sakarya River Basin, Yeşilırmak River Basin, Zamantı River (Başören & Kazancı 2016).

Remarks: The presence of *Simulium kiritshenkoi* in Anatolia has been known since 1975. Jedlicka (1975) first reported this species as the synonym *Odagmia ornata caucasica* Rubtsov, 1940 from Afyon province. The species is currently known as one of the most common species in Türkiye (Şirin *et al.* 2015). Crosskey & Zwick (2007) recorded this species from Bolu province. This species is a new record for the remaining provinces of the study area. *Simulium kiritshenkoi* is a member of the *ornatum* species group, which is one of the most populous and taxonomically complex species groups of Simuliidae in the Palearctic region of the family. In our study, we identified the specimens of this species according to Rubtsov (1956) by considering the following characters; ventral plate shape of mature male pupa, common stem structures of pupal gill filaments, dome-shaped thoracic tubercles of pupa.

Simulium (Simulium) ornatum species complex

Material examined: **(11)** 1 pupa; **(27)** 57 larvae, 43 pupae; **(40)** 8 larvae, 2 pupae; **(33)** 75 larvae, 21 pupae; **(47)** 2 larvae, 8 pupae; **(64)** 2 larvae, 5 pupae; **(68)** 20 larvae, 19 pupae.

Remarks: These specimens belongs to the *S. ornatum* species complex, and were found at 7 different localities. They are similar morphologically to *S. kiritshenkoi* but differ in the common stems and height of the pupal gill filaments. Since there are no mature larvae, pupae or adults in our material of this species for more accurate identification, we preferred to give the species as *S. ornatum* species complex.

Simulium (Simulium) variegatum Meigen, 1818

Material examined: **(4)** 13 larvae, 6 pupae; **(5**) 28 larvae, 11 pupae; **(7)** 14 pupae; **(22)** 14 larvae, 3 pupae; **(25)** 47 larvae; **(66)** 4 pupae; **(70)** 24 larvae.

World Distribution: Algeria, Andorra, Armenia, Austria, Azerbaijan, Belgium, Bosnia and Herzegovina, Great Britain, Bulgaria, Croatia, Czech Republic, France, Georgia, Germany, Greece, Hungary, Iran, Ireland, Italy, Lebanon, Montenegro, Morocco, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye, Ukraine (Adler 2022).

Distribution in Türkiye: Kocaeli (Şirin *et al.* 2014), Altındere Stream (in Trabzon), Ceyhan River Basin, Çoruh River Basin, Dicle River Basin, Fırat River Basin, Fırtına Stream, Köyceğiz Protected Area, Sakarya River Basin, Salda Lake Basin, Zap River (Başören & Kazancı 2016).

Remarks: *Simulium variegatum* is characterized with the presence of two large thoracic bulges (patagia) of pupae (Bass, 1998). Crosskey & Zwick (2007) recorded this species from Bolu province. Besides, this species is a new record for the remaining provinces of the study area. This species is widely distributed in Türkiye (Başören & Kazancı 2016) and also common in the western Palearctic Region (Adler 2022).

Simulium (Wilhelmia) balcanicum (Enderlein, 1924)

Material examined: **(9)** 1 pupa; **(11)** 1 female, 4 pupae; **(13)** 30 pupae, 10 larvae; **(14)** 5 pupae; **(15)** 1 pupa; **(16)** 6 pupae; **(17)** 6 pupae; **(27)** 3 pupae; **(29)** 3 pupae, 84 larvae; **(34)** 11 pupae; **(37)** 6 pupae; **(39)** 1 pupa; **(45)** 16 pupae.

World Distribution: Albania, Austria, Bulgaria, Belarus, Bosnia and Herzegovina, Croatia, Germany, Greece, Hungary, Italy, Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Türkiye, Ukraine (Adler 2022).

Distribution in Türkiye: Büyük Menderes River Basin, Eastern Black Sea region, Kızılırmak River Basin, Sakarya River Basin, Yeşilırmak River Basin (Başören & Kazancı 2016).

Remarks: *Simulium balcanicum* is a common species both in Türkiye and in the countries around it. Crosskey & Zwick (2007) recorded this species from Bolu province. This species is a new record for the remaining provinces of the study area. Unlike other species of the subgenus *Wilhelmia* Enderlein, 1921, two of the six tubular filaments of this species are located on a common stem. This feature was also clearly observed in our pupae.

Simulium (Wilhelmia) equinum (Linnaeus, 1758)

Material examined: **(27)** 13 pupae.

World Distribution: Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Great Britain, Bulgaria, Czech Republic, China, Croatia, Denmark, Estonia, Finland, France, Georgia, Germany, Hungary, Ireland, Italy (incl. Sardinia), Kazakhstan, Latvia, Liechtenstein, Lithuania, Macedonia, Moldova, Montenegro, Morocco, The Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Siberia,

Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye, Ukraine (Adler 2022).

Distribution in Türkiye: Sakarya River Basin (Şirin & Şahin, 2005) and Kızılcahamam (Ankara) Crosskey & Zwick (2007).

Remarks: It can be easily identified by the banana-like gill branches of the pupae of *Simulium equinum* which is the first described species of the family. This species was recorded for the first time in Anatolia from the Sakarya River Basin by Şirin & Şahin (2005). Crosskey & Zwick (2007) also found it in a river near Ankara, Kızılcahamam. Although the species is rare in Mediterranean countries, it has a wide distribution in the Palearctic (Crosskey & Zwick 2007).

Simulium (Wilhelmia) pseudequinum Seguy, 1921

Material examined: **(6)** 1 larvae; **(9**) 6 pupae; **(11)** 3 pupae; **(13)** 5 pupae; **(14)** 11 pupae; **(15)** 16 pupae; **(16)** 2 females, 167 pupae; **(17)** 47 larvae, 11 pupae; **(18)**, 2 pupae; **(20)** 59 larvae, 32 pupae; **(21)** 3 larvae, 9 pupae; **(23)** 3 larvae, 4 pupae; **(24)** 4 larvae; **(26)** 15 pupae; **(27)** 22 pupae; **(28)** 2 pupae; **(29)** 43 pupae; **(30)** 25 pupae; **(31)** 1 pupa; **(34)** 12 pupae; **(35)** 23 pupae; **(37)** 2 pupae; **(38)** 9 pupae; **(39)** 24 pupae; **(41)** 2 larvae; **(42)** 1 pupa; **(45)** 3 females , 2 males 50 pupae; **(46)** 6 larvae; **(47)** 1 female, 6 larvae, 5 pupae; **(48)** 3 larvae, 1 pupa; **(57)** 2 larvae; **(59)** 1 pupa; **(64)** 2 pupae.

World Distribution: Algeria, Armenia, Austria, Azerbaijan, Bosnia and Herzegovina, Great Britain, Bulgaria, China (Sx, Xi), Croatia, Cyprus, France, Georgia, Greece (incl. Andros, Chios, Crete, Ikaria, Lesbos, Naxos, Rhodes), India (Kashmir, Pu), Iran, Iraq, Israel, Italy, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Libya, Macedonia, Moldova, Montenegro, Morocco, Pakistan, Portugal, Romania, Russia (Caucasus), Serbia, Slovakia, Slovenia, Spain (including Canary Islands-Gran Canaria, Gomera, Tenerife), Tajikistan, Tunisia, Türkiye, Turkmenistan, Ukraine Uzbekistan (Adler 2022).

Distribution in Türkiye: Marmara River Basin (Şirin *et al.* 2014); Ankara Stream, Büyük Menderes River Basin, Çoruh River Basin, Eastern Black Sea Region, Fırat River Basin, Namnam Stream, Sakarya River Basin, Seyhan River Basin, Yeşilırmak River Basin, Yuvarlakçay Stream, Zamantı River (Başören & Kazancı 2016).

Remarks: *Simulium pseudequinum* is the most abundant species in the study area and was sampled from 33 river sources. It is not surprising that this species, which is the most common species in Anatolia and the Palearctic region, is also the dominant species in the study area. Crosskey & Zwick (2007) recorded this species from Bolu province. This species is a new record for the remaining provinces of the study area. *Simulium pseudequinum* differs from other species of the Subgenus *Wilhelmia* Enderlein, 1921, especially in the shape of the ventral plate in the male genitalia and the shirred bases of the tubular gill filaments (Crosskey & Malicky 2001). These features were observed in our material.

Simulium (Wilhelmia) turgaicum Rubtsov, 1940

Material examined: **(27)** 2 larvae, 1 pupa.

World Distribution: Afghanistan, Armenia, Azerbaijan, Bosnia and Herzegovina, China, Iran, Iraq, Kyrgyzstan, Lebanon, Pakistan, Slovenia, Tajikistan, Türkiye, Turkmenistan, Ukraine, Uzbekistan (Adler 2022).

Distribution in Türkiye: Büyük Menderes River Basin, Çoruh River Basin, Kızılırmak River Basin, Sakarya River Basin, Yeşilırmak River Basin, Yuvarlakçay Stream (Başören & Kazancı 2016).

Remarks: *Simulium turgaicum* was recorded as *S. lineatum* (Meigen, 1804) from the major river basins in Türkiye in previous studies (Başören & Kazancı 2016). The most distinctive feature of the species is the presence of finger-shaped tubular gill filaments, which is also observed in our samples. On the other hand, Adler *et al.* (2015) suggested the use of the name *S. turgaicum*, which is a synonym for the Anatolian populations of *S. lineatum* in their study in which they revealed the cytogenetic phylogeny of *Wilhelmia* Enderlein, 1921 species disturbed in the Palearctic. It is also in the latest version of the world checklist published by Adler (2022).

Discussion

In the present study, new contributions were provided for the distributional data of 14 black fly species in Anatolia. *Simulium (Nevermannia) carthusiense* Grenier & Dorier, 1959 was reported for the first time from the country.

Simulium carthusiense has a wide distribution in Europe (Fig. 3) [(Andorra, Austria, Czech Republic, France (incl. Corsica), Germany, Italy, Morocco, Poland, Slovakia, Spain, Switzerland, Ukraine (Adler 2022)]. Our record constitutes the eastern border of the distribution of this species. Larvae and pupae were collected from Çanakçar Stream (Bartın province) and Ortaköy Stream (Kastamonu province) from 162 m and 1,043 m above sea level, respectively. According to Adler & Seitz (2014), preadult stages of the species are mostly found in fast-flowing mountain streams at elevations of 300-2,500 m, and pupae occurs in June. In the present study this species was found on 11 June and in two different rapid flowing watercourses.

In this study, species identifications were done by using only morphotaxonomic methods. However, it is known that cryptic diversity is very common in the Simuliidae, and both cytogenetic and DNA-based data are needed to determine the taxonomic status of some species belonging to species complexes and species groups (Adler *et al.* 2004). Similarly, we think that further taxonomic studies using cytogenetic and molecular techniques should be carried out to establish

the taxonomic status of species belonging to the species groups such as *S. ornatum* and *S. vernum* identified in the study.

According to the results of present study, bloodsucking species such as *Simulium bezzii*, *S. kiritshenkoi* and *S. turgaicum* are distributed in the region. An outbreak of *S. bezzii* occurred in the Eastern Anatolia region in previous years and it caused the death of more than 100 cattle (Şirin *et al.* 2015). So, monitoring methods should be developed for pest populations of black flies in the region to ensure public health and protection of livestock.

Fig. 3. Distribution map of *S. carthusiense.*

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Author Contributions: All authors contributed equally to this manuscript in its all stages.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: The study was supported by the Eskisehir Osmangazi University Scientific Research Projects Coordination Unit with project number 201619A220.

References

1. Adler, P.H. 2022. World blackflies (Diptera: Simuliidae): a comprehensive revision of the taxonomic and geographical inventory. http: www.clemson.edu/cafls/departments/esps/biomia/pdfs/blackflyinventory.pdf (Date accessed: 05.04.2022).
2. Adler, P.H., Currie, D.C. & Wood, D.M. 2004. *The Black flies (Simuliidae) of North America*. Ithaca, NY, 960 pp.
3. Adler, P.H. & Seitz, G. 2014. Chromosomal characteristics and evolutionary relationships of the Palearctic blackfly *Simulium carthusiense* (Diptera: Simuliidae*). European Journal of Entomology*, 111(4): 469-474.
4. Adler, P.H., Inci, A., Yildirim, A., Duzlu, O., McCreadie, J.W., Kúdela, M., Khazeni, A., Brúderová, T., Seitz, G., Takaoka, H., Otsuka, Y. & Bass, J. 2015. Are blackflies of the subgenus *Wilhelmia* (Diptera: Simuliidae) multiple species or a single geographical generalist? Insights from the macrogenome. *Biological Journal of the Linnean Society*, 114: 163-183.
5. Aslan, B. 2021. *COI ve ITS 1-2 Gen Bölgeleri İle Prosimulium rachiliense Djafarov, 1954 (Diptera: Simuliidae) Türü Türkiye Populasyonlarının Genetik Çeşitliliklerinin Araştırılması.* Master thesis, Eskişehir Osmangazi University, Graduate School of Natural and Applied Sciences, Eskişehir, 82 pp.
6. Austen E.E. 1925. A contribution to knowledge of the blood-sucking Diptera of the Dardanelles. *Bulletin of EntomologicalResearch*, 16: 1-23.
7. Bass, J. 1998. *Last-instar larvae and pupae of the Simuliidae of Britain and Ireland*. Cumbria: United Kingdom, 102 pp.
8. Başören, Ö. & Kazancı, N. 2016. A checklist of Simuliidae (Insecta, Diptera) species of Turkey. *Review of Hydrobiology*, 9(2): 153-164.
9. Başören, Ö. & Kazancı, N. 2020. Distribution of aquatic Diptera larvae of Yeşilırmak River (Turkey) and ecological characteristics. *Ege Journal of Fisheries and Aquatic Sciences*, 37(4): 397-407.
10. Başören, Ö. & Kazancı, N. 2021. Ecological requirements of larval Simuliidae (Insecta, Diptera) species of some streams in Camili Valley (Artvin, Turkey). *Acta Aquatica Turcica*, 17(1): 97-107.
11. Crosskey, R.W. 1990. *The Natural History of Black flies*. Chichester, 711 pp.
12. Crosskey, R.W. 1998. Records of blackflies from mainland Greece (Diptera: Simuliidae). *Entomologist's Gazette*, 49: 277-283.

13. Crosskey, R.W. 2002. A taxonomic account of the blackfly fauna of Iraq and Iran, including keys for species identification (Diptera: Simuliidae). *Journal of Natural History*, 36: 1841-1886.

14. Crosskey, R.W. & Malicky, H. 2001. A first account of the black flies (Diptera, Simuliidae) of the Greek Islands. *Studia Dipterologica*, 8: 111-141.

15. Crosskey, R.W & Howard, T.M. 2004. A Revised Taxonomic and Geographical inventory of World Blackflies (Diptera:Simuliidae). Department of Entomology. Natural history museum. London. http://www.nhm.ac.uk/research-curation/projects/blackflies/ (Date accessed: 05.04.2022)

16. Crosskey, R.W. & Zwick, H. 2007. New faunal records, with taxonomic annotations, for the blackflies of Turkey (Diptera, Simuliidae). *Aquatic Insects*, 29: 21-48.

17. Çağlar, S.S. & İpekdal, K. 2009. A biogeographical evaluation of the Turkish Simuliidae fauna. *Acta Zoologica Lituanica*, 19: 148-151.

18. Fidan, E.C. 2020. *Türkiye Simulium ornatum tür grubunun (Simuliidae: Diptera), filogenisi, filocoğrafyası ve taksonomisi*. PhD thesis, Eskişehir Osmangazi University, Graduate School of Natural and Applied Sciences, Eskişehir, 189 pp.

19. Gazyağcı, A.N. & Aydenizöz, M.N. 2019. Prevalance of *Simulium* Species in the Kızılırmak River Basin in Ankara and Kırıkkale Territories. *International Journal of Veterinary and Animal Research*, 2(3): 76-82.

20. Jedlicka, L. 1975. *Odagmia ornata caucasica* Rubtsov,1940 (Diptera,Simuliidae) in Turkey. *Acta Rerum Naturalium Musei Nationalis Slovaciae Bratislava*, 21: 255-258.

21. Jedlicka, L., Kudela, M., & Stloukalova, V. 2004. Key to the identification of blackfly pupae (Diptera: Simuliidae) of Central Europe. *Biologia Bratislava*, 59(15): 157-178.

22. Kazancı, N. & Clergue Gazeau, M. 1990. Simuliidae de Turquie. I. Premiéres données faunistiques et biogeographiques (Diptera, Simuliidae). *Annales de Limnologie*, 26: 45-50.

23. Knoz, J. 1965. To identification of Czechoslovakian black-flies (Diptera, Simuliidae). *Folia Pírodovdecké Fakulty University, J. E*., 6(5): 1-142.

24. Kuşvuran, A., Nazlı, R.İ. & Tansı, V. 2011. Türkiye'de ve Batı Karadeniz Bölgesi'nde Çayır-Mera Alanları, Hayvan Varlığı ve Yem Bitkileri Tarımının Bugünkü Durumu. *Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Dergisi*, 28(2): 21-32.

25. Onder, Z., Yildirim, A., Duzlu, O., Arslan, M.O., Sari, B., Tasci, G.T., Ciloglu, A., Parmaksizoglu Aydin, N., Inci, A. &Adler, P. H. 2019. Molecular characterization of black flies (Diptera: Simuliidae) in areas with pest outbreaks and simuliotoxicosis in Northeast Anatolia Region, Turkey. *Acta Tropica*, 199: 105149.

26. Özel, B., Yay, T.E. & Tekin Özan, S. 2019. Isparta Deresi'nin Su Kalitesinin Fizikokimyasal Parametrelere ve Simuliidae Faunasına Göre Belirlenmesi. *Acta Aquatica Turcica*, 15(4): 487-498.

27. Rubtsov, I.A. 1956. *Blackflies (fam. Simuliidae) [Moshki (sem. Simuliidae)]. Fauna of the USSR, New Series No. 64, Insects, Diptera [Fauna SSSR Novaya seriya No. 64, Nasekomye dvukrylye]* 6 (6). Moscow: Leningrad. Akademii Nauk SSSR. [In Russian: English translations 'Blackflies (Simuliidae) Second Edition New Delhi, 1989 and E.J. Brill, Leiden, 1990]. 1042 pp.

28. Şirin, U. & Şahin, Y.2005. New records of black flies (Diptera, Simuliidae) for the Turkish fauna, *Zoology in the Middle East*, 36: 87-98.

29. Şirin, Ü.D., Fidan, E.C., Çalışkan, H. & Şahin, Y. 2014. Black flies (Diptera: Simuliidae) records from East Marmara Region. *Munis Entomology and Zoology*, 9(2): 822- 831.

30. Şirin, Ü. & Adler, P.H. 2015.Chromosomal and morphological taxonomy of a new species of Black fly in the genus *Metacnephia (Diptera: Simuliidae)* from Western Anatolia, Turkey. *Zootaxa*, 4048(2): 269-280.

31. Şirin, Ü., Çalışkan, H. & Şahin, Y., 2015. Black flies (Diptera: Simuliidae) of Turkish Thrace, with a new record for Turkey. *Biodiversity Data Journal*, 3: e4834. doi: 10.3897/BDJ.3.e4834

32. Terteryan, A.E. 1968. *Blackflies (Simuliidae): Fauna of the Armenian SSR, Diptera [Moshki (Simuliidae) Fauna Armyanskoi SSR, Nasekomye dvukrylye]*. Yerevan: SSR. 272 pp.

33. Yankovsky, A.V. 2003 [2002]. A key for the identification of blackflies (Diptera: Simuliidae) of Russia and adjacent countries (former USSR) [Opredelitel' moshek (Diptera: Simuliidae) Rossii i sopredel'nykh territoriy (byvshego SSSR)]. Saint Petersburg. 569 pp.

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S41-S51, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1106928

Research Article
Special Issue: Biodiversity of Insects

A MOSQUITO SURVEY OF CULICIDAE SPECIES AT EDİRNE CENTRAL DISTRICT FOR DISEASE VECTOR

Zafer ŞAKACI[1], Yılmaz CAMLITEPE[2*]

[1] Balıkesir University, Faculty of Science and Literature, Department of Biology, Balıkesir, TÜRKİYE
[2] Trakya University, Faculty of Science, Department of Biology, Edirne, TÜRKİYE

Cite this article as:

Şakacı Z. & Camlitepe Y. 2022. A mosquito survey of Culicidae species at Edirne central district for disease vector. *Trakya Univ J Nat Sci*, 23(Special Issue): S41-S51, DOI: 10.23902/trkjnat.1106928

Received: 21 April 2022, Accepted: 07 July 2022, Online First: 17 July 2022, Published: 20 July 2022

Abstract: Mosquitoes are the major vectors that can transmit many diseases agents to humans and animals. This study was conducted in Edirne central district between July 2017 and July 2018 to identify important mosquito vector species, to determine their seasonality and distribution pattern in general terms. Larvae, pupae, and adults were collected from areas assessed as being particularly suitable for medically important species of the genus *Aedes* Meigen, *Culex* Linnaeus, and *Anopheles* Meigen. In addition to the foci naturally found in the areas, ovitraps placed in suitable places for ovipositing were also used. As a result, a total of 3155 females and 353 males belonging to 11 species of 5 genera were obtained. Among these species, *Anopheles sacharovi* Favre (the primary vector of malaria in Turkey) and *Culex pipiens* s.l. Linnaeus (the primary vector of West Nile Fever) has been recognized as a public health threat to the province. *Anopheles sacharovi* was present at a very low population level, while *Cx. pipiens* s.l. was determined as the most common and numerous species in the study area. Known to have a high preference for warmer climate compared to members of the *Anopheles maculipennis* s.l. Meigen, *An. sacharovi* has the risk of increasing its population in the region with possible global warming in the future. The importance of this risk increases even more since rice production is widespread especially in Edirne and this species can use the paddy fields as an effective breeding place. While *Aedes caspius* Pallas was commonly encountered, *Aedes albopictus* Skuse was not found during the field observation and ovitrap controls.

Özet: Sivrisinekler birçok hastalık etkenini insanlara ve hayvanlara bulaştırabilen en önemli vektörlerdir. Bu çalışma, önemli vektör sivrisinek türlerini belirlemek, genel anlamda mevsimselliklerini ve dağılım şekillerini belirlemek amacıyla Temmuz 2017-Temmuz 2018 tarihleri arasında Edirne merkez ilçesinde yürütülmüştür. Medikal olarak önem arz eden *Aedes* Meigen, *Culex* Linnaeus ve *Anopheles* Meigen cinslerine ait türler için özellikle uygun olduğu değerlendirilen alanlardan larva, pupa ve erginler toplanmıştır. Bunun yanı sıra uygun noktalara ovitraplar yerleştirilmiştir. Sonuç olarak elde edilen 3155 dişi ve 353 erkek sivrisineğin 5 cinse ait 11 tür olduğu saptanmıştır. Bu türlerden *Anopheles sacharovi* Favre (Türkiye'de sıtmanın birincil vektörü) ve *Culex pipiens* s.l. Linnaeus (Batı Nil Ateşinin birincil vektörü), il için bir halk sağlığı tehdidi olarak kabul edilmiştir. *Anopheles sacharovi* çok düşük bir popülasyon düzeyinde temsil edilirken, *Cx. pipiens* s.l. çalışma alanında en yaygın ve yoğun tür olarak belirlenmiştir. *Anopheles maculipennis* Meigen tür kompleksi üyelerine kıyasla daha sıcak iklimi tercih ettiği bilinen *An. sacharovi*, gelecekte olası bir küresel ısınma ile bölgedeki nüfusunu artırma riski taşımaktadır. Özellikle Edirne'de çeltik üretiminin yaygın olması ve bu türün çeltik tarlalarını etkili bir üreme yeri olarak kullanabilmesi nedeniyle bu riskin önemi daha da artmaktadır. *Aedes caspius* Pallas türüne yaygın olarak rastlanırken, arazi gözlemleri ve ovitrap kontrolleri sırasında *Ae. albopictus* Skuse türüne rastlanmamıştır.

Edited by:
Kadri KIRAN

Corresponding Author:
Yilmaz Camlitepe
yilmazc@trakya.edu.tr

ORCID iDs of the authors:
ZŞ. orcid.org/ 0000-0002-6736-3792
YC. orcid.org/ 0000-0002-9759-2609

Key words:
Mosquitoes
Aedes albopictus
Anopheles sacharovi
Edirne
Malaria

Introduction

Mosquitoes are the main factor for the spread of many diseases such as dengue fever, yellow fever, chikungunya, West Nile fever, encephalitis, malaria, and filariasis. Due to this vectorial capacity and the high adaptability to new areas, systematic follow-up of these mosquito species is very important, particularly in areas that pose a risk for mosquito-mediated diseases. (Becker *et al.* 2010). Although many studies on mosquito fauna have been

conducted in Turkey, most of them have been based on the identification of species and roughly determining their distribution characteristics (Parrish 1959, Ramsdale *et al.* 2001, Günay 2015).

Edirne, which is located between important rivers and therefore frequently subjected to floods, is a province where the most paddy cultivation is carried out with an area of 443,097 acres in Turkey (Taşlıgil & Şahin 2011). Besides the city has favourable climatical factors for mosquito development, it has also suitable conditions where new mosquito species entering the region can easily reproduce and establish. In addition, Edirne is a place used by irregular migrants from the Middle East, Asia, and Africa as a gateway to Europe (Deniz 2015). The reasons mentioned above provide advantages in terms of the entry and spread of mosquito-borne diseases in Edirne.

West Nile virus (WNV) cases are seen because of the coexistence of birds and vector mosquitoes in areas located on wild bird migration routes around the world. In Eastern Thrace, including Edirne, one of the most important bottle necks takes place on the wild bird migration routes between Africa and Europe (Kirwan *et al.* 2014). In molecular studies conducted in this region, *Cx. pipiens* Linnaeus was found to be the major dominant species (Günay 2015). Therefore, the current situation has made Eastern Thrace a hot spot where WNV is endemic today.

The mosquito fauna of Turkey is represented by 61 species (Parrish 1959, Ramsdale 2001, Günay 2015). In Eastern Thrace, 6 species belonging to 3 genera in Çanakkale; 28 species belonging to 6 genera in Edirne; 7 species belonging to 4 genera in İstanbul (European part); 27 species belonging to 6 genera in Kırklareli; 16 species belonging to 5 genera were identified in Tekirdağ (Öter 2007, Çağlar *et al.* 2008, Sevgili 2009, Koçak & Kemal 2014, Öter & Tüzer 2014, Günay 2015, Akbay 2016, İpek 2016, Sarıkaya 2017).

This study aimed to determine the important vector mosquito species in Edirne central district by evaluating the larvae, pupae and adult forms collected at different times from areas suitable for mosquito species in the study area and to correlate the data to be obtained with previous studies to form an assessment about possible risks that may threaten public health in the future.

Materials and Methods

Geographical and climatic characteristics of the study area

Edirne (41°40'37.09"N, 26°33'21.41"E) is located in the Thrace part of Turkey. The most important stream of the province is the Meriç River, which forms a natural border with Greece. The Arda, Tunca and Ergene rivers join the Meriç River in Edirne. Three types of vegetation can be seen in the province, namely maquis, steppe and forest. The climate is warm and temperate. The annual average temperature is 13.5°C. Annual average precipitation per square meter is 597 mm (Climate-data.org 2021). The averages of temperature and humidity levels in the province throughout the study are given below (Fig. 1).

Study area

The study was carried out in 30 localities selected in the central district of Edirne province between July 2017 and July 2018. Larvae, pupae, and adults were collected in areas that were found to be suitable for breeding of different mosquito species. In addition, ovitraps were also set up in selected localities. The localities where the field studies were carried out and the sampling methods are given below (Fig. 2).

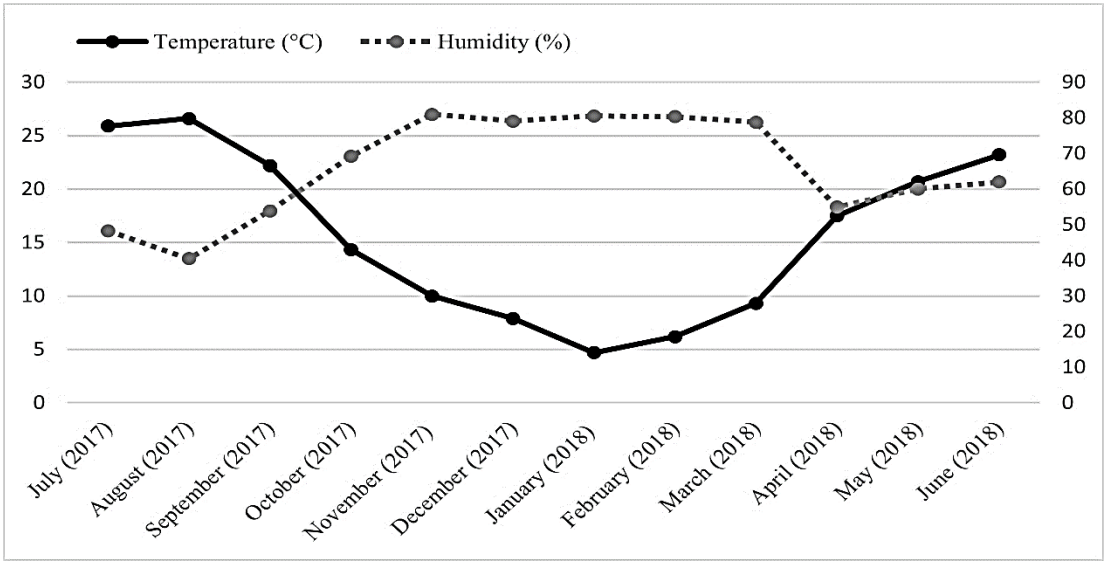

Fig. 1. Average temperature and humidity level of Edirne central district during the study period (Data from Turkish State Meteorological Service, between the years 2017-2018 (https://mgm.gov.tr/eng/forecast-cities.aspx).

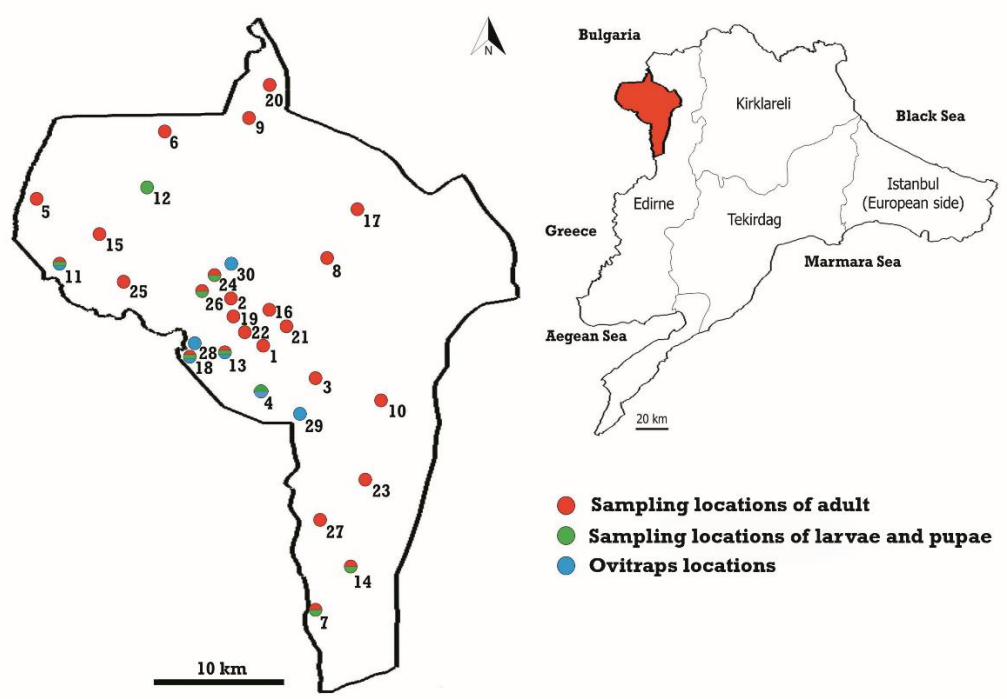

Fig. 2. The localities where the field studies were carried out and the sampling methods are presented on the map, during July 2017-July 2018 in the central district of Edirne (For locality names and distribution of mosquito species, please see Table 1)

Sampling of adults

Mosquito adults were collected from indoor and outdoor areas with a mouth aspirator during the resting and over-wintering periods. Diurnal and crepuscular species were collected from the exposed limbs and other parts of people's bodies by human-landing catches (HLC) method using a manual aspirator (Service 1993). Particular attention was paid to sampling the adults who took shelter in closed areas during the sudden rain showers observed immediately after the extremely dry periods. Adults collected with mouth aspirators were brought to the laboratory in 500 ml plastic bottles with field data records. The bottles were stored at -20°C until species identification.

Sampling and rearing of larvae and pupae

Larvae and pupae were collected from aquatic habitats with a small larval dipper and a Pasteur pipette. It was then brought to the laboratory with some habitat water together with field data records in 1200 ml volume containers. Samples were taken into plastic containers (bottom dimensions: 18x25 cm; height: 15 cm; ceiling dimensions: 20x29 cm) up to 5 cm high, placed in their habitat water, and stored at 24-25°C. The upper surfaces of the containers placed in a part of the laboratory that are not exposed to direct sunlight are covered with mesh. During the rearing process, the larvae were checked once a day. They were offered some baby fish food (Mikromin®), especially on days when there was excessive activity in the larvae, which indicates food-seeking. Feeding was completely discontinued when the pupal stages predominated. The emerging adults were collected from the containers with a mouth aspirator and transferred to 500 ml plastic bottles. The bottles were stored at -20°C until species identification.

Construction, placement and control of ovitraps

Plastic containers with a diameter of 12 cm at the top, 7.5 cm at the bottom, 11 cm in height and with a volume of 1000 ml were used as ovitrap. A water drainage hole with a diameter of 1 cm was opened 4 cm below the top of the containers that were painted black. The top is covered with a thick wire mesh. Two strips of 12 cm length and 2.5 cm width, one made of masonite and the other made of poplar wood, were used to be placed in the container. Both surfaces of the strips have been sanded. During the three-day period prior to the setup of the ovitraps, the strips were soaked in dechlorinated water for two days and left to dry for one day. Wire fasteners are made to fix the strips in the container.

For the supply of *Ae. albopictus* Skuse eggs, ovitraps were established in the areas suitable for the bio-ecology of the species (Arda-2 pieces (41°39'35.59"N, 26°29'42.96"E, 38 m), Bosna Village-1 piece (41°39'35.59"N, 26°29'42.96"E, 38 m), Karaağaç-4 pieces (41°38'3.35"N, 26°31'51.02"E, 35 m), Kapıkule-7 pieces (41°42'36.33"N, 26°22'28.67"E, 42 m), Pazarkule-2 pieces (41°39'15.56"N, 26°29'24.12"E, 43 m), Sarayiçi-2 pieces (41°41'29.68"N, 26°33'35.40"E, 40 m), Topsöğüt-2 pieces (41°36'47.94"N, 26°35'52.08"E, 32 m). Ovitraps were placed in areas that are green, wooded, shaded, easily accessible, with a space of at least 1 m high at the top (Carrieri *et al.* 2011), and less affected by wind (Suter *et al.* 2016). The containers were tied to either a tree or a wood driven into the ground, in contact with the

ground. Ovitraps filled with water (600 ml) up to the discharge hole were fixed in opposing positions with one masonite and one poplar strip wire fasteners with an inclination of 45°.

Ovitraps were used during the period of 20 July-30 September, during which time the presence of eggs in the strips was checked with a magnifying glass once every ten days. In addition, the presence of larvae, pupae and their exuvia in the ovitrap was also checked. At each control, the water of the ovitrap was replaced with freshly dechlorinated water.

Identification of mosquitoes

Species identification of the adult mosquitoes obtained from the field surveys and immature stages reared under laboratory conditions were identified using a stereomicroscope (Olympus SZ51) based on the morphological keys described before (Gutsevich *et al.* 1974, Darsie & Samanidou-Voyadjoglou 1997, Becker *et al.* 2010).

Results

This study was carried out in 88 foci in 30 localities selected in the central district of Edirne province between July 2017 and July 2018. Common species in the sampling area were *Ae. caspius* Pallas (14/30), *An. maculipennis* s.l. Meigen (except *An. sacharovi*) (20/30), *Cx. pipiens s.l.* Linnaeus (20/30). The locality information of the collected species is given in Table 1.

Table 1. Distribution of mosquito species collected in Edirne central district during the period of July 2017-July 2018.

Number of location	Locality	Habitat	Number of foci	Coordinates	Altitude	Number of species	Mosquito species
1	Abdurrahman Neighborhood	Urban	2	41°39'59.29"N, 26°33'56.38"E	39 m	2	*Ae. caspius* *Cx. pipiens* s.l.
2	Babademirtaş Neighborhood	Urban	1	41°40'52.90"N, 26°33'23.62"E	60 m	1	*Cx. pipiens* s.l.
3	Balkan Campus	Urban	5	41°38'13.78"N, 26°36'38.06"E	43 m	8	*Ae. caspius* *Ae. geniculatus* *An. maculipennis* s.l.* *An. sacharovi* *Cs. annulata* *Cs. longiareolata* *Cx. pipiens* s.l. *Ur. unguiculata*
4	Bosna Village	Rural	2	41°37'31.10"N, 26°33'55.33"E	34 m	1	*Ae. caspius*
5	Budakdoğanca Village	Rural	1	41°45'39.55"N, 26°20'31.84"E	112 m	1	*An. maculipennis* s.l.*
6	Büyükismailce Village	Rural	2	41°48'55.25"N, 26°28'06.95"E	184 m	1	*An. maculipennis* s.l.*
7	Doyran Village	Rural	4	41°29'20.35"N, 26°36'27.64"E	34 m	2	*Ae. caspius* *An. maculipennis* s.l.*
8	Hasanağa Village	Rural	1	41°43'26.92"N, 26°37'32.08"E	60 m	1	*Ae. caspius*
9	Hatip Village	Rural	1	41°49'17.31"N, 26°33'24.11"E	42 m	1	*An. maculipennis* s.l.*
10	İskender Village	Rural	3	41°37'47.30"N, 26°40'22.80"E	87 m	3	*Ae. caspius* *Ae. rusticus* *Cx. pipiens* s.l.
11	Kapıkule	Urban	8	41°42'47.94"N, 26°22'05.70"E	44 m	3	*Ae. caspius* *An. maculipennis* s.l.* *Cx, pipiens* s.l.
12	Karabulut Village	Rural	1	41°46'06.09"N, 26°26'13.41"E	119 m	4	*An. maculipennis* s.l.* *Cx. pipiens* s.l. *Cx. theileri* *Ur. unguiculata*
13	Karaağaç	Urban	13	41°39'20.84"N, 26°31'36.92"E	36 m	6	*Ae. caspius* *Ae. geniculatus* *Ae. vexans* *An. maculipennis* s.l.* *Cs. annulata* *Cx. pipiens* s.l.
14	Karakasım Bucağı Village	Rural	3	41°31'0.82"N, 26°38'38.45"E	39 m	3	*Ae. caspius* *An. maculipennis* s.l.* *Cx. pipiens* s.l.

15	Kemalköy	Rural	2	41°44'7.85"N, 26°23'40.79"E	83 m	1	*An. maculipennis* s.l.*
16	Kıyık	Urban	1	41°40'45.01"N, 26°34'23.97"E	102 m	3	*An. maculipennis* s.l.* *Cs. longiareolata* *Cx. pipiens* s.l.
17	Küçükdöllük Village	Rural	2	41°45'13.39"N, 26°40'0.75"E	81 m	2	*An. maculipennis* s.l.* *Cx. pipiens* s.l.
18	Pazarkule	Urban	8	41°39'15.46"N, 26°29'23.96"E	43 m	4	*An. maculipennis* s.l.* *An. sacharovi,* *Cx. pipiens* s.l. *Ur. unguiculata*
19	Sabuni Neighborhood	Urban	1	41°40'27.76"N, 26°33'23.71"E	50 m	2	*Ae. caspius* *Cx. pipiens* s.l.
20	Suakacağı Village	Rural	2	41°50'29.69"N, 26°35'9.75"E	52 m	2	*An. maculipennis* s.l.* *Cx. pipiens* s.l.
21	Şükrüpaşa Neighborhood	Urban	1	41°40'14.46"N, 26°35'36.95"E	95 m	2	*An. maculipennis* s.l.* *Cx. pipiens* s.l.
22	Talatpaşa Neighborhood	Urban	1	41°40'8.37"N, 26°33'34.24"E	36 m	2	*An. maculipennis* s.l.* *Cx. pipiens* s.l.
23	Tayakadın Village	Rural	4	41°34'25.73"N, 26°39'35.78"E	53 m	2	*Ae. caspius* *An. maculipennis* s.l.*
24	Yeniimaret Neighborhood	Urban	2	41°41'18.14"N, 26°32'29.61"E	37 m	1	*Cx. pipiens* s.l.
25	Yenikadın Village	Rural	2	41°42'1.78"N, 26°26'19.35"E	63 m	3	*An. maculipennis* s.l.* *An. sacharovi* *Cx. pipiens* s.l.
26	Yıldırım Beyazıt Neighborhood	Urban	4	41°40'46.08"N, 26°31'37.61"E	55 m	3	*Ae. caspius* *An. maculipennis* s.l.* *Cx, pipiens* s.l.
27	Üyüklütatar Village	Rural	4	41°32'47.96"N, 26°36'31.11"E	41 m	3	*Ae. caspius* *An. maculipennis* s.l.* *Cx, pipiens* s.l.
28	Arda	Urban	2	41°39'35.59"N, 26°29'42.96"E	38 m	0	-
29	Topsöğüt	Rural	2	41°36'47.94"N, 26°35'52.08"E	32 m	0	-
30	Sarayiçi	Urban	3	41°41'29.68"N, 26°33'34.10"E	39 m	4	*Ae. caspius* *Ae. geniculatus* *Ae. vexans* *Cx. pipiens* s.l.

* except *An. sacharovi*

As a result of the research, 5 genera and 11 species belonging to 2 subfamilies were determined. In total, 3,155♀/353♂ adult individuals obtained during the study period: 217 (177♀/40♂) *Ae. caspius* Pallas, 7 (♀) *Ae. geniculatus* Olivier, 2 (♀) *Ae. rusticus* Rossi, 17 (♀) *Ae. vexans* Meigen, 646 (594♀/52♂) *An. maculipennis* s.l. Meigen, 3 (♀) *An. sacharovi* Favre, 4 (3♀/1♂) *Cs. annulata* Schrank, 3 (♂) *Cs. longiareolata* Macquart, 2594 (2338♀/256♂) *Cx. pipiens* s.l. Linnaeus, 4 (♀) *Cx. theileri* Theobald, and 11 (10♀/1♂) *Ur. unguicualta* Edwards.

While *Ae. caspius*, *An. maculipennis* s.l. and *Cx. pipiens* s.l. were the most common species in our study area *Ae. geniculatus*, *Ae. rusticus*, *Ae. vexans*, *An. sacharovi*, *Cs. annulata*, *Cs. longiareolata*, *Cx. theileri*, *Ur. unguiculata* were less common (Fig. 3).

The collected materials and collecting methods are given in Table 2.

Terrestrial and aquatic habitats where the species were collected are presented in Table 3.

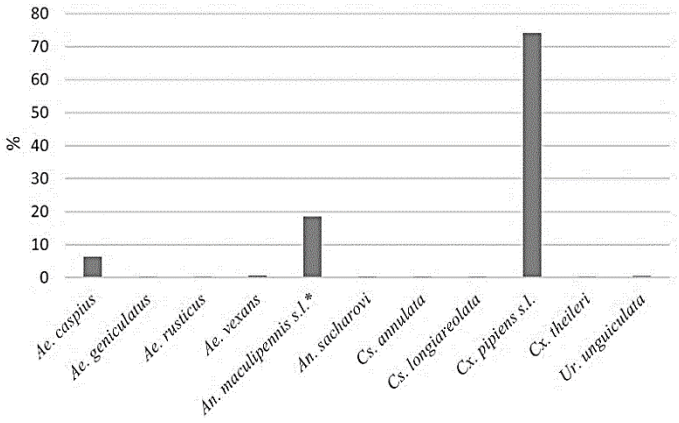

Fig. 3. The distribution rates of the species collected in Edirne central district during the period of July 2017-July 2018.

Table 2. The distribution rates for the species according to collection method.

Collection Methods (Stage) / Species	Counts of samples collected using mouth aspirator (Adult) (%)		Counts of samples collected using larval dipper and/or pasteur pipette (Larva-pupa) (%)	Counts of samples collected using ovitrap (Egg-larva) (%)
	Indoor (%)	Outdoor (%)		
Ae. caspius (Pallas, 1771)	42 (19.35)	72 (33.18)	103 (47.47)	-
Ae. geniculatus (Olivier, 1791)	1 (14.29)	6 (85.71)	-	-
Ae. rusticus (Rossi, 1790)	-	2 (100)	-	-
Ae. vexans (Meigen, 1830)	-	17 (100)	-	-
An. maculipennis s.l.* Meigen, 1818	607 (93.96)	-	39 (6.04)	-
An. sacharovi Favre, 1903	3 (100)	-	-	-
Cs. annulata (Schrank, 1776)	4 (100)	-	-	-
Cs. longiareolata (Macquart, 1838)	3 (100)	-	-	-
Cx. pipiens s.l. Linnaeus, 1758	2119 (81.69)	-	361 (13.92)	114 (4.39)
Cx. theileri (Theobald, 1903)	-	-	4 (100)	-
Ur. unguiculata Edwards, 1913	3 (27.27)	-	8 (72.73)	-
Total number of species (%)	**2782 (79.30)**	**97 (2.77)**	**515 (14.68)**	**114 (3.25)**
Mouth aspirator distribution	**2782 (96.63)**	**97 (3.37)**	**-**	**-**
Methods distribution	**2879 (82.07)**		**515 (14.68)**	**114 (3.25)**

Table 3. Terrestrial and aquatic habitats where the species were collected.

Species	Adult sampling																Larval and pupa sampling									
	Indoor														Outdoor											
	Tree hollow	Concrete structure	house	Barrel (without water)	Hospital	Cow barn	Cafe	Sheep barn	Well (without water)	School	Bus	Restaurant	Hennery	public WC	Forest	Bus station	Waste water channel	Marsh	Paddy irrigation canal	Paddy field	Corn irrigation canal	Ovitrap	Cattle urine collection duct	Leaking trough water	Puddle	Water trough
An. maculipennis s.l.*	X	X		X		X		X	X	X			X	X					X					X		
An. sacharovi		X				X			X																	
Ae. caspius	X	X	X	X		X	X	X		X	X	X		X	X			X		X	X				X	
Ae. geniculatus										X					X											
Ae. rusticus																X										
Ae. vexans															X											
Cx. pipiens s.l.	X	X	X	X	X	X		X	X	X			X	X	X		X	X		X		X	X	X	X	X
Cx. theileri																								X		
Cs. annulata		X								X																
Cs. longiareolata		X								X																
Ur. unguiculata		X								X														X		X

Adults of *Anopheles sacharovi* were collected by mouth aspirator in 3 localities; Balkan Campus (loc. no. 3/n=1), Pazarkule (loc. no. 18/n=1), and Yenikadın village (loc. no. 25/n=1).

No egg, larva and pupal exuviae of *Ae. albopictus* were found as a result of the control of ovitraps placed at 20 points in 7 localities during the period of 20 July-30 September. In addition, after the ovitraps control procedure, no adult forms were found in the controls made with a mouth aspirator around the ovitraps. In the ovitraps we placed in Karaağaç and Kapıkule, *Cx. pipiens* larvae were detected instead of the targeted species *Ae. albopictus.*

According to the monthly count, the most adult sampling was carried out in December. Sampling could not be carried out as samples were not found in February and March (Table 4).

Table 4. Monthly count of adults collected during the period of July 2017-July 2018.

Months	Total mosquito count	Mosquito species	Number of mosquitoes (♀-♂)
July 2017	183	*Ae. caspius*	128 (102-26)
		Ae. geniculatus	4 (4-0)
		An. maculipennis s.l.*	9 (7-2)
		Cx. pipiens s.l.	42 (34-8)
Aug 2017	700	*Ae. caspius*	69 (58-11)
		An. sacharovi	1 (1-0)
		An. maculipennis s.l.*	447 (427-20)
		Ur. unguiculata	4 (4-0)
		Cx. pipiens s.l.	175 (118-57)
		Cx. theileri	4 (4-0)
Sept 2017	271	*Ae. caspius*	4 (3-1)
		An. sacharovi	2 (2-0)
		An. maculipennis s.l.*	75 (45-30)
		Cx. pipiens s.l.	186 (116-70)
		Ur. unguiculata	4 (3-1)
Oct 2017	247	*Ae. caspius*	7 (5-2)
		Cs. longiareolata	1 (0-1)
		Cx. pipiens s.l.	239 (134-105)
Nov 2017	242	*Ur. unguiculata*	2 (2-0)
		An. maculipennis s.l.*	64 (64-0)
		Cs. longiareolata	2 (0-2)
		Cs. annulata	2 (2-0)
		Cx. pipiens s.l.	172 (158-14)
Dec 2017	1690	*Ur. unguiculata*	1 (1-0)
		An. maculipennis s.l.*	51 (51-0)
		Cs. annulata	1 (1-0)
		Cx. pipiens s.l.	1637 (1635-2)
Jan 2018	1	*Cs. annulata*	1 (0-1)
Feb 2018	-	-	-
Mar 2018	-	-	-
Apr 2018	34	*Ae. geniculatus*	1 (1-0)
		Cx. pipiens s.l.	33 (33-0)
May 2018	61	*Ae. caspius*	3 (3-0)
		Ae. vexans	2 (2-0)
		Ae. geniculatus	2 (2-0)
		Ae. rusticus	2 (2-0)
		Cx. pipiens s.l.	52 (52-0)
June 2018	79	*Ae. caspius*	6 (6-0)
		Ae. vexans	15 (15-0)
		Cx. pipiens s.l.	58 (58-0)
Total	3508		

Discussion

In this research a total of 11 species was identified under two genera belonging to two subfamilies (Anophelinae and Culicinae). A total of 3155 females and 353 males were collected belonging to *Anopheles maculipennis* s.l. (except *Anopheles sacharovi*), *Anopheles sacharovi*, *Aedes caspius*, *Aedes geniculatus*, *Aedes rusticus*, *Aedes vexans*, *Culex pipiens* complex s.l., *Culex theileri*, and *Culiseta annulata*. The data revealed that *Ae. caspius*, *An. maculipennis* s.l. and *Cx. pipiens* s.l. are the most widespread species. Any biological stages of *Aedes albopictus*, whether eggs, larvae or adults, were not found in the research area.

In the last 10 years before this study, *An. sacharovi* was recorded in two localities in Enez district (Enez-İpsala road and Gala Lake side), one locality in the central district (Üyüklütatar village) (Çağlar *et al*. 2008) and İpsala district (Sevgili & Simsek 2012). During this study, *An. sacharovi* was identified in 3 localities (Balkan Campus, n=1/locality no. 3; Pazarkule, n=1/locality no. 18; and Yenikadin village, n=1/locality no. 25) in the central district of Edirne indicating that the species is distributed throughout the province, albeit at low population levels. These findings and the previous records, which have been reported mostly from Anatolian and lesser European parts (Çağlar *et al*. 2008, Simsek *et al.* 2011, Sevgili & Simsek 2012, Günay 2015, Yavaşoğlu *et al.* 2019), have shown that *An. sacharovi*, the primary malaria vector in Turkey (Alten *et al*. 2000, Özbilgin *et al.* 2011), continues to exist. Although malaria has been largely eliminated in Turkey, it is known that endemism continues in the south-eastern Anatolia Region (Akıner & Çağlar 2010). All these facts indicate that the risk of local malaria outbreaks continues due to the increasing pressure of irregular migration movements from malaria endemic countries and increasing average air temperatures (WHO 2013).

It is important to examine the question of whether the malaria vector *Anopheles* detected so far in Eastern Thrace is capable of carrying *P. vivax* and *P. falciparium* parasites. With this study, when historical and recent studies are evaluated, there is no doubt that *An. sacharovi* stands out compared to other *Anopheles* species. In experimental infection carried out in laboratory conditions, *An. sacharovi* has been shown to be highly susceptible to *P. vivax* strains originating from Africa, Asia and South America. In experiments investigating the development cycle of imported *P. falciparum* strains,

parasites did not develop in most experiments, but oocysts and sporozoites were found in mosquitoes in some experiments (Daskova & Rasnicyn 1982). Again, it has been stated that the species is highly sensitive to European strains of *P. falciparum* (Alten & Çağlar 1998). In the comprehensive malaria surveillance screening conducted throughout Edirne between 1994 and 2002, *P. vivax* was detected in 280 of the 317,087 blood donors selected from military unit personnel and local people, and *P. ovale* was found in one student from Afghanistan. In a study, in which it was stated that domestic cases had not been seen since 1998, it was shown that external cases were caused by military personnel, especially from the south-eastern Anatolia Region (Ay *et al.* 2002). On the other hand, in 1999 in Aydın (Ertuğ *et al.* 2002) and between the period of 2013 and 2014 in Bursa (Alver & Ener 2018), *P. vivax* was registered in a person who was reported to have come to these provinces from Edirne. According to Edirne Provincial Health Directorate data, *P. vivax* originated from Afghanistan in 2015 and from Pakistan in 2016. According to Trakya University Hospital data, *P. falciparum* and *P. malariae* were detected in 5 people with a history of traveling to Burkino Faso, Angola, Ivory Coast and Equatorial Guinea in the 2013-2016 period (Figen Kuloğlu, pers. comm.). Between 2011 and 2012, in Greece, bordering Edirne province, 38 imported malaria cases among immigrants from malaria endemic countries and 46 local *P. vivax* malaria cases broke out in the local population. It has been suggested that this transmission is due to the interaction of *An. sacharovi*, which is common in the area where malaria cases occur and throughout Greece, and immigrants (Tseroni *et al.* 2015). Under this circumstance, if malaria is not followed up on irregular migrants crossing to Europe using Edirne as a gateway, and especially on military personnel coming from the south-eastern Anatolia Region, the risk of malaria cases breaking out in the province in the coming years because of their association with *An. sacharovi* should not be ignored. Although faunistic studies on *An. sacharovi* mostly focus on the southern parts of Turkey, investigation of the status of *An. sacharovi* populations in the north-western (Marmara Region) part in detail is important for public health since it is the last stop for irregular immigrants before they leave for Europe, and they stay in this region longer than other regions. Moreover, since the climate in the north-western parts have become continental recently and temperatures have increased, it is predicted that the risk will increase in the future for *P. falciparum* and *P. vivax* as the development cycle in the mosquito becomes shorter and conditions become more suitable for these two malarial parasites. The fact that *An. sacharovi*, which has an anthropophilic character, is a vector that cannot be ignored in the transmission of the malaria parasite (Alten & Çağlar 1998), and although the number of cases in the province is low, necessary surveillance programs for vector *Anopheles* species must be followed due to the risk that exogenous cases may turn into local cases.

Aedes albopictus is the major invasive mosquito species (Medlock *et al.* 2015). It was first recorded in Europe in 1979 in Albania and in 1990 in Italy. Today, it is found in more than 25 countries in the region including Bulgaria, Greece, Romania, Serbia and other Balkan countries, Italy, France, Germany, Malta, Sicily, Spain, Switzerland, Russia's Black Sea coast, Georgia, Lebanon, Israel, Syria, Saudi Arabia, and Yemen in the Middle East (Medlock *et al.* 2015, Akiner *et al.* 2016). In Turkey, established colonies were found in the Eastern Black Sea region (Akiner *et al.* 2016), almost along the entire Black Sea coastline of Thrace and Istanbul (Şakacı 2021). Previously, *Ae. albopictus* eggs were encountered in Keşan and İpsala districts of Edirne during a field surveys carried out in 2011 using ovitrap (Oter *et al.* 2013). However, in the surveys conducted in the following years targeted to the adult mosquito, no specimens were encountered in the same region (Sırrı Kar, pers. comm.). In 2018, a species was found in a locality with intense mosquito complaints on the Marmara coast of Kocaeli (Şakacı 2021). Models created for the whole of Europe demonstrated that particularly the coastal parts of the Marmara Region, the whole of Thrace, the entire Black Sea coast, and the Eastern Mediterranean Region (seacoasts of Adana, Hatay, Osmaniye) are ideal residential areas for *Ae. albopictus* (Cunze *et al.* 2016). Although its role in nature for many disease agents has not been fully elucidated, *Ae. albopictus* has the potential to transmit at least 32 viruses, including DENV (Dengue fever virus), CHIKV (Chikungunya fever virus), WNV (West Nile fever virus), ZIKV (Zika virus), and YFV (Yellow fever virus) (Gratz 2004, Paupy *et al.* 2009, Vanlandingham *et al.* 2016). In our study, *Ae. albopictus* eggs, larvae, pupae and adults were not found. Although Edirne has suitable areas (especially Karaağaç, Sarayiçi) specified in the literature (Thavara *et al.* 2001, Paupy *et al.* 2009, Higa 2011, Little *et al.* 2017), it seems that the species does not have a resident population. In the light of all these data, periodic follow-up of the species, which has entered Edirne before and has not established colonies in the province today, should be carried out in the areas where it can be reintroduced in the future.

In this study, adults of *Ae. caspius* were found in May, June, July, August and September, and larvae were found in October. Our findings were compared with a study investigating the seasonal population dynamics of the mosquito fauna in the Po delta of Italy (Verenossi *et al.* 2012), where rice cultivation is carried out intensively just like Edirne. It has been stated that *Ae. caspius* can feed on humans and animals in rural and urban areas (Gutsevich *et al.* 1974). In the study area, it is not surprising that the species shows both resting and feeding behaviour on human and even ungulates in indoor places (i.e., house, cow barn, sheep pen, school, restaurant, coffee shop, public toilet, bus) when temperature and humidity parameters affect the species negatively. As a matter of fact, intense mosquito complaint phone calls, petitions and e-mails were sent to Edirne Municipality Public Health Unit between 15 July 2017 and 10 August 2017.

When the results of our field studies are evaluated, it can be seen that the mosquito problem that continues from the second half of July to August is clearly caused by *Ae. caspius* bites. In the first half of August, *Ae. caspius* which does not exist outdoors, turns completely indoors and therefore may have been the cause of complaints to the unit throughout August, if indoor bites were not carried out by another species.

During July, large-scale mass attacks caused by *Ae. caspius* raise the question of where the species' breeding habitat is. As a matter of fact, as a result of the larvae samplings carried out in July, 59 mosquito larvae were detected in 100 ml of water sample taken from the rice field of Karakasım Subdistrict (loc. no: 14), and these larvae were almost monoculture *Ae. caspius* species (36♀/19♂ *Ae. caspius*, 3♀/1♂ *Cx. pipiens* s.l.). Even in such a small sampling of rice water, the large number of *Ae. caspius* larvae points out that the primary source of the *Ae. caspius* problem is the paddy fields, which are represented by very high decare areas in Edirne. In the province, the level of the *Ae. caspius* population is closely related to the water yield to the paddy pans and the water cut periods. The first water is given to the paddy pans in May, and this management seems to be the first spark for the population of the species. The highest water yield occurs in July first and August second. With the increase in the amount of water used in July, the increase in the population level of the species was clearly reflected in the field. As the temperature increased and humidity decreased in August, an increase in the population level was detected indoors due to the tendency of the species to sheltered areas. In September, the water yield to the pans is cut off and the harvest time of the paddy begins at the end of September and the first week of October (Tuna 2012). Among the species identified, *Ae. caspius* is the main species that bites people outdoors, especially in July. Intensive paddy cultivation was carried out and in Edirne, where the *Ae. caspius* reproduces so much in rice, plans should be developed to save people from the disturbance caused by the species. In the solution of this problem, the approach to be followed in the paddy fields will be decisive.

During the study, mosquitoes were collected from indoors using aspirator immediately after periods of extremely dry and rapid rain transitions. During these periods, it has been observed that mosquitoes gather by moving indoors. It was observed that the samples obtained using this collecting approach, which was carried out with aspirator, were morphologically suitable for species identification. It has been observed that indoor collections made in extreme weather conditions allow mosquitoes to congregate indoors, thus providing access to a dense mosquito population of the region. In addition, it was observed that unexpected species were encountered in unexpected periods, as many local mosquito species that do not normally use indoors due to challenging weather conditions took shelter indoors. Indeed, in such a period *An. sacharovi* was found inside a reinforced concrete structure. In addition, even outdoor mosquitoes such as *Ae. caspius* which has a strong exophilic character have been found indoors (Gutsevich *et al*. 1974). If the suction tube is combined with other mosquito trapping methods, it is likely that it is an instrument that can increase the success of the detection of important vectorial species and shorten the detection time.

Conclusion

With the predicted global temperature increase in the future, Edirne is expected to be an effective gateway for the entry of malaria agents such as *P. vivax* and *P. falciparum* to the Thrace Region and subsequently to Europe. An organized mosquito monitoring and control program is urgently needed in the region where many disease agents could be established in the area.

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Author Contributions: Concept: Y.C., Z.Ş., Design: Y.C., Z.Ş., Execution: Y.C., Z.Ş., Material supplying: Y.C., Z.Ş., Data acquisition: Y.C., Z.Ş., Data analysis/interpretation: Y.C., Z.Ş., Writing: Y.C., Z.Ş., Critical review: Y.C., Z.Ş.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: This research was supported by the Scientific Research Projects Unit of Trakya University with the project numbered TUBAP 2018/132.

References

1. Akbay, Y. 2016. *Monthly propagation characteristics of Culex spp. in Tekirdag* (MSc Thesis), Namık Kemal University, Tekirdağ, 53 pp.
2. Akıner, M.M. & Çağlar, S.S. 2010. Birecik, Beyşehir ve Çankırı bölgelerinde Anopheles maculipennis grup türlerinin polimeraz zincir reaksiyonu (PZR) kullanarak araştırılması. *Türkiye Parazitoloji Dergisi*, 34(1): 50-54.
3. Akiner, M.M., Demirci, B., Babuadze, G., Robert, V. & Schaffner, F. 2016. Spread of the Invasive Mosquitoes *Aedes aegypti* and *Aedes albopictus* in the Black Sea Region Increases Risk of Chikungunya, Dengue, and Zika Outbreaks in Europe. *PLoS Neglected Tropical Diseases*, 10(4): 1-5.
4. Alten, B. & Çağlar, S.S. 1998. *Vektör ekolojisi ve mücadelesi. "Sıtma vektörünün biyo-ekolojisi mücadele organizasyonu ve yöntemleri"*. Bizim Büro Basımevi, Ankara, 238 pp.
5. Alten, S.B., Çağlar, S.S. & Özer, N. 2000. Malaria and its vectors in Turkey. *European Mosquito Bulletin*, 7: 27-33.
6. Alver, O. & Ener, B. 2018. Bursa'da 2013-2014 yılları arasında sıtma epidomiyolojisi. *Türk Hijyen ve Deneysel Biyoloji Dergisi*, 75(1): 37-42.
7. Ay, G., Gürcan, Ş., Otkun, M.T., Tuğrul, M. & Otkun, M. 2004. Edirne'de 1994-2002 yılları arasında saptanan sıtma olgularının özellikleri. *Mikrobiyoloji Bülteni*, 38: 113-120.

8. Becker, N., Petric, D., Zgomba, M., Boase, C., Madon, M., Dahl, C. & Kaiser, A. 2010. *Mosquitoes and Their Control*. Second Edition. Springer, Heidelberg, New York, 577 pp.

9. Carrieri, M., Albieri, A., Angelini, P., Baldacchini, F., Venturelli, C., Mascali, Zeo S. & Bellini, R. 2011. Surveillance of the chikungunya vector *Aedes albopictus* (Skuse) in Emilia-Romagna (northern Italy): organizational and technical aspects of a large scale monitoring system. *Journal of Vector Ecology*, 36(1): 108-116.

10. Climate-data.org. Climate data for cities worldwide. https://en.climate-data.org. (Data accessed: August 2021).

11. Cunze, S., Koch, L.K., Kochmann, J. & Klimpel, S. 2016. *Aedes albopictus* and *Aedes japonicus* – two invasive mosquito species with different temperature niches in Europe. *Parasites and Vectors*, 9: 573.

12. Çağlar, S.S., Skavdis, G., Özer, N., Alten, B., Şimşek F.M., Akıner, M.M., Kaynaş, S., Kuyucu, A.C. & Vontas, J. 2008. Study of the Resistance in Commonly Used Insecticides, of Natural Mosquito Populations, in the Province of Thrace (Greece and Turkey). TÜBİTAK TBAG Final Project Report 105T531. Ankara, 114 pp.

13. Darsie, R.E. & Samanidou-Voyadjoglou, A. 1997. Keys for the identification of the mosquitoes of Greece. *Journal of the American Mosquito Control Association*, 13: 247-254.

14. Daskova, N.G. & Rasnicyn, S.P. 1982. Review of data on susceptibility of mosquitos in the USSR to imported strains of malaria parasites. *Bulletin of the World Health Organization*. 60(6): 893-897.

15. Deniz, O. 2015. Ortadoğu ve Asya Kökenli Göçmenlerin Göç Güzergahında Türkiye Opsiyonu. *Sosyoloji Divanı*, 6: 209-231.

16. Ertuğ, S., Gürel, M., Eyigör, M. & Doyuran, E.S. 2002. Aydın yöresinde sıtma olguları. *Adnan Menderes Üniversitesi Tıp Fakültesi Dergisi*, 3(2): 5-8.

17. Gratz, N.G. 2004. Critical review of the vector status of *Aedes albopictus*. *Medical and Veterinary Entomology*, 18(3): 215-227.

18. Gutsevich, A.V., Monchadskii, A.S. & Shtakel`berg, A.A. 1974. *Fauna SSSR, family Culicidae*. IPST Publishers, Leningrad, 412 pp.

19. Günay, F. 2015. *Molecular analyses of the mosquito fauna of Turkey through DNA barcoding* (PhD Thesis), Hacettepe University, Ankara, 120 pp.

20. Higa, Y. 2011. Dengue vectors and their spatial distribution. *Tropical Medicine and Health*, 39(4): 17-27.

21. İpek, E. 2016. *Monthly propagation characteristics of Culiseta spp. in Tekirdag* (MSc Thesis), Namık Kemal University, Tekirdağ, Turkey, 52 pp.

22. Kirwan, G.M., Ozen, M., Ertuhan, M. & Atahan, A. 2014. Turkey Bird Report 2007-2011. *Sandgrouse*, 36: 146-175.

23. Koçak, A.Ö. & Kemal, M. 2014. Revised and advanced list of dipteran species of Turkey. *Cesa News*, 98: 14-105.

24. Little, E., Bajwa, W. & Shaman, J. 2017. Local environmental and meteorological conditions influencing the invasive mosquito *Ae. albopictus* and arbovirus transmission risk in New York City. *PLoS Neglected Tropical Diseases*, 11(8): e0005828. https://doi.org/10.1371/journal.pntd.0005828

25. Medlock, J.M., Hansford, K.M., Versteirt, V., Cull, B., Kampen, H., Fontenille, D., Hendrickx, G., Zeller, H., Van, Bortel W. & Schaffner, F. 2015. An entomological review of invasive mosquitoes in Europe. *Bulletin of Entomological Research*, 105(6): 637-663.

26. Oter, K., Gunay, F., Tuzer, E., Linton, Y.M., Bellini, R. & Alten, B. 2013. First record of *Stegomyia albopicta* in Turkey determined by active ovitrap surveillance and DNA barcoding. *Vector Borne Zoonotic Diseases*, 13(10): 753-61.

27. Öter, K. 2007. *Identification of the mosquito species in İstanbul, Turkey* (PhD Thesis), İstanbul University, İstanbul, 177 pp.

28. Öter, K. & Tüzer, E. 2014. Composition of mosquito species (Diptera: Culicidae) in Istanbul. *Journal of Faculty of Veterinary Medicine, Istanbul University*, 40(2): 249-259.

29. Özbilgin, A., Topluoglu, S., Es S., Islek, E., Mollahaliloglu, S. & Erkoc, Y. 2011. Malaria in Turkey: Successful control and strategies for achieving elimination. *Acta Tropica*, 120: 15-23.

30. Parrish, D.W. 1959. The mosquitoes of Turkey. *Mosquito News*, 19: 264-266.

31. Paupy, C., Delatte, H., Bagny, L., Corbel, V. & Fontenille, D. 2009. *Aedes albopictus*, an arbovirus vector: From the darkness to the light. *Microbes and Infection*, 11(14-15): 1177- 1185.

32. Ramsdale, C.D., Alten, B., Çaglar, S.S. & Özer, N. 2001. A revised, annotated checklist of the mosquitoes (Diptera, Culicidae) of Turkey. *European Mosquito Bulletin*, 9: 18-27.

33. Sarıkaya, Y. 2017. *Identification of mosquito species (Diptera: Culicidae) around refugee zones of the Turkish border with Syria and on migration routes of refugees* (MSc Thesis), Hacettepe University, Ankara, 64 pp.

34. Service, M.W. 1993. *Mosquito Ecology. "Field sampling methods"*. Second edition. Elsevier Science Publishers, Essex, 988 pp.

35. Sevgili, E. 2009. Molecular characterization of *Anopheles maculipennis* complex (Diptera: Culicidae) in Turkey. Master's thesis. Adnan Menderes University, Aydın, Turkey, 70 pp.

36. Sevgili, E. & Simsek, F.M. 2012. Distribution Pattern and Molecular Identification of *Anopheles maculipennis* Complex in Eight River Basins of Anatolia, Turkey. *North-Western Journal of Zoology*, 8(2): 223-231.

37. Simsek, F.M., Ulger, C., Akiner, M.M., Tuncay, S.S., Kiremit, F. & Bardakci, F. 2011. Molecular identification and distribution of *Anopheles maculipennis* complex in the Mediterranean region of Turkey. *Biochemical Systematics and Ecology*, 39(4–6): 258–265.

38. Suter, T.T., Flacio, E., Feijoó Fariña B., Engeler, L., Tonolla, M., Regis, L.N., de Melo Santos M.A.V. & Müller, P. 2016. Surveillance and control of *Aedes albopictus* in the Swiss-Italian border region: differences in egg densities between intervention and non- intervention

areas. *PLoS Neglected Tropical Diseases*, 10(1): e0004315. doi:10.1371/journal. pntd.0004315

39. Şakacı, Z. 2021. Contribution to mosquito (Diptera: Culicidae) fauna of Sakarya province and the first record of the invasive vector *Aedes albopictus* (Skuse, 1894) for Kocaeli province. *Journal of Balıkesir University Instıtute of Science and Technology*, 23(1): 10-21.

40. Taşlıgil, N. & Şahin, G. 2011. Türkiye'de çeltik (*Oryza sativa* L.) yetiştiriciliği ve coğrafi dağılımı. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi,* (6): 182-203.

41. Thavara, U., Tawatsin, A. & Chansang, C. 2001. Larval occurrence, oviposition behaviour and biting activity of potential mosquito vectors of dengue on Samui Island, Thailand. *Journal of Vector Ecology*, 26(2): 172-180.

42. Tseroni, M., Baka, A., Kapizioni, C., Snounou, G., Tsiodras, S., Charvalakou, M., Georgitsou, M., Panoutsakou, M., Psinaki, I., Tsoromokou, M., Karakitsos, G., Pervanidou, D., Vakali, A., Mouchtouri, V., Georgakopoulou, T., Mamuris, Z., Papadopoulos, N., Koliopoulos, G., Badieritakis, E., Diamantopoulos, V., Tsakris, A., Kremastinou, J. & Hadjichristodoulou, C. 2015. Prevention of malaria resurgence in Greece through the association of mass drug administration (mda) to immigrants from malaria-endemic regions and standard control measures. *PLoS Neglected Tropical Diseases*, 9(11): e0004215, doi: 10.1371/journal.pntd.0004215.

43. Tuna, B. 2012. *Trakya Koşulları Çeltik (Oryza sativa L.) Tarımında Farklı Sulama Uygulamaları ve Su-Verim Kalite İlişkilerinin Belirlenmesi* (PhD Thesis), Namık Kemal University, Tekirdağ, 109 pp.

44. Vanlandingham, D.L., Higgs, S. & Huang, Y.J.S. 2016. *Aedes albopictus* (Diptera: Culicidae) and mosquito-borne viruses in the United States. *Journal of Medical Entomology*, 53(5): 1024-1028.

45. Veronesi, R., Gentile, G., Carrieri, M., Maccagnani, B., Stermieri, L. & Bellini, R. 2012. Seasonal pattern of daily activity of *Aedes caspius*, *Aedes detritus*, *Culex modestus*, and *Culex pipiens* in the Po Delta of northern Italy and significance for vector-borne disease risk assessment. *Journal of Vector Ecology*, 37: 49-61.

46. World Health Organization & University of California, San Francisco. 2013. The long road to malaria elimination in Turkey. Case-study No. 5, Geneva: World Health Organization, 79 pp. https://apps.who.int/iris/bitstream/handle/10665/94961/9789241506403_eng.pdf?sequence=1&isAllowed=y (Data accessed: April 2022).

47. Yavaşoglu, S.İ., Yaylagül, E.Ö., Akıner, M.M., Ülger, C., Çağlar, S.S. & Şimşek, F.M. 2019. Current insecticide resistance status in *Anopheles sacharovi* and *Anopheles superpictus* populations in former malaria endemic areas of Turkey. *Acta Tropica*, 193: 148-157.

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S53-S64, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1115893

Research Article
Special Issue: Biodiversity of Insects

CONTRIBUTION TO THE KNOWLEDGE OF THE ZYGAENIDAE (LEPIDOPTERA) OF TÜRKİYE

Feza CAN[1]*, Başak ULAŞLI[1], Evrim KARAÇETİN[2], Serdar AKAR[3]

[1] Hatay Mustafa Kemal University, Faculty of Agriculture, Department of Plant Protection, Hatay, TÜRKİYE
[2] Erciyes University, Faculty of Engineering, Department of Environmental Engineering, Kayseri, TÜRKİYE
[3] B. Gerdelli No: 256, Süloğlu, Edirne, TÜRKİYE

Cite this article as:

Can F., Ulaşlı B., Karaçetin E, & Akar S. 2022. Contribution to the knowledge of the Zygaenidae (Lepidoptera) of Türkiye. *Trakya Univ J Nat Sci*, 23(Special Issue): S53-S64, DOI: 10.23902/trkjnat.1115893

Received: 12 May 2022, Accepted: 08 July 2022, Published: 20 July 2022

Edited by:
Kadri KIRAN

Corresponding Author:
Feza Can
fezacan@mku.edu.tr

ORCID iDs of the authors:
FC. orcid.org/0000-0002-0737-6145
BU. orcid.org/ 0000-0002-0989-2020
E.K. orcid.org/0000-0002-7311-1989
S.A. orcid.org/0000-0002-6377-6506

Key words:
Zygaeninae
Procridinae
Moth
Endemic
Fauna
Systematic

Abstract: The aim of this study is to contribute to the recent distribution and systematic classification of Zygaenidae (Lepidoptera) in 12 provinces in the Aegean, eastern Anatolia, and Thrace regions of Türkiye, with the records obtained from May 2020 to September 2021. Specimens were collected or photographed at 49 out of 132 localities. Twenty Zygaenidae species from five genera belonging to Procridinae and Zygaeninae subfamilies were recorded: *Theresimima* Strand, 1917 (1 species), *Rhagades* Wallengren, 1863 (1 species), *Adscita* Retzius, 1783 (1 species), *Jordanita* Verity, 1946 (5 species), and *Zygaena* Fabricius, 1775 (12 species). *Zygaena* (*Zygaena*) *ephialtes* (Linnaeus, 1767) was recorded again nearly 200 years later since after Herrich-Schäffer's first record in 1845. *Zygaena* (*Mesembrynus*) *lydia* Staudinger, 1887 endemic to Türkiye, was also recorded in this study. In addition, new localities of *Zygaena* (*Agrumenia*) *armena* Eversman, 1851, which is known only in Türkiye and Georgia, were also recorded from the Ardahan province in the eastern Anatolia region of Türkiye.

Özet: Bu makalenin amacı, Türkiye'nin Ege, Doğu Anadolu ve Trakya bölgelerindeki 12 ilde bulunan Zygaenidae (Lepidoptera)'nin yakın dönemdeki dağılımı ve sistematik sınıflandırmasına Mayıs 2020- Eylül 2021 tarihleri arasında elde edilen kayıtlarla katkı sağlamaktır. Ziyaret edilen 132 alandan 49'unda Zygaenid güveleri toplanmış ya da fotoğraflanmıştır. Procridinae ve Zygaeninae alt familyalarına ait, 5 cinse giren, 20 Zygaenidae türü belirlenmiştir: *Theresimima* Strand, 1917 (1 tür), *Rhagades* Wallengren, 1863 (1 tür), *Adscita* Retzius, 1783 (1 tür), *Jordanita* Verity, 1946 (5 tür), ve *Zygaena* Fabricius, 1775 (12 tür). *Zygaena* (*Zygaena*) *ephialtes* (Linnaeus, 1767) de yaklaşık 200 yıl önceki Herrich-Schäffer (1845)'in ilk kaydından sonra Türkiye'nin Trakya bölgesindeki yeniden kaydedilmiştir. Türkiye'ye endemik olan *Zygaena* (*Mesembrynus*) *lydia* Staudinger, 1887, bu çalışmada güncel olarak kaydedilmiştir Ayrıca, sadece Türkiye ve Gürcistan'da bilinen *Zygaena* (*Agrumenia*) *armena* Eversman, 1851'ya ait yeni lokaliteler Doğu Anadolu Bölgesinde, Ardahan ilinden iletilmiştir.

Introduction

Türkiye is located at the intersection of three different phytogeographic vegetation zones; The Euro-Siberian, Irano-Turanian and Mediterranean regions (FAO 2019). Each region has high level of endemism and contains a rich species diversity considering both flora and fauna (FAO 2019). Euro-Siberian Region extends from Bulgaria along most of north Anatolia to the west, and to Georgia in the north. The Irano-Turanian Region, the largest of the three regions, is confined to central and eastern Anatolia.The Mediterranean region reflects the communities of the East Mediterranean extending from eastern half of Italy to Lebanon (Davis 1965-1985, Takhtajan *et al.* 1986, FAO 2019).

Türkiye, acting as both a bridge and a barrier between Asia and Europe, is one of the most species-rich countries in the western Palaearctic Region in terms of flora and fauna (Çıplak 2003). Thrace is the region that covers the part on the European side of Türkiye, and includes the Edirne, Kırklareli and Tekirdağ provinces and the western sections of İstanbul and Çanakkale provinces. The surface area of Thrace region corresponds to 3% of Türkiye with 23,485 km^2. Asian side of Türkiye (Anatolia) is a biologically diverse region since its variable topography and climate provide many different macro or micro habitats; the region is a bridge between Asia and Europe in the south and to the Ethiopian region via the Arabian

Peninsula. It thus provides a natural pathway for the spread of species both via the north-south and east-west routes. Its tectonic evolution has continuously changed through Tertiary and Quaternary periods, providing an important refuge during the Quaternary ice ages receiving populations via the Balkans and/or the Caucasus (Çıplak 2003). Consequently, Anatolia has a distinctive zoogeography and habitat diversity. The European continent consists of approximately 15,000 plant species. The number of described taxa in Türkiye's flora is around 12,000 (11,707) of which 31.82% is endemic to the country (Güner 2014).

The loss of biological diversity in the Anthropocene era has been shown as one of the most intense environmental problems today (UN 2020). Biodiversity is rapidly declining at an unprecedented rate due to many threats, mainly loss of habitats by industrialization, urbanization, industrialization in agriculture, and climate change (Warren 2021). Considering all these threats, discovering the natural richness of Türkiye must be given more priority. Like all living organisms, the order Lepidoptera is adversely affected by all these factors (Karaçetin *et al.* 2011). To be able to protect species, scientific studies including producing distribution maps, and identifying relevant threats are required. This study concentrates on one of the most prominent families of Lepidoptera, Zygaenidae family. The Zygaenidae family contains several endemic species in Türkiye. Identification of endemic and other zygaenid species, determination of their biological characteristics and defining their current distribution are extremely crucial for future conservation practices in Türkiye.

Zygaenidae is a species rich family of predominantly diurnal moths with a worldwide distribution, being most diverse in tropical and subtropical Asia and Palearctic regions (Epstein 1996). The family, commonlyknown as burnet, forester, and smoky moths, contains more than 1,000 species distributed worldwide and the number of described species increases annually (Efetov *et al.* 2021). Zygaenid moths are distributed along a variety of natural and occasionally secondary habitats, from coastal dunes and cliffs and dry Mediterranean landscapes to various arboreal habitats and even high alpine and extreme boreal regions (Tarmann 2003). Based on the recent revisions, Zygaenidae includes five subfamilies: Chalcosiinae (Palearctic, Oriental), Callizygaeninae (Oriental), Inouelinae (Oriental), Procridinae (Holarctic, Afrotropical, Oriental, Australian, Neotropical) and Zygaeninae (Palearctic, Oriental, Afrotropical) (Alberti 1954, 1958, 1959, Tarmann 1984, 1994, 2004, Hofmann & Tremewan 1996, Efetov 1999, Yen 2003, Efetov & Tarmann 2012, 2014, 2016, 2017, Efetov *et al.* 2014, 2019, Ulaşlı & Can 2021).

The early studies of the family in Türkiye are based on the records from Anatolia by Zeller and Mann in 1847 and 1862 respectively. Subsequently Holik & Sheljuzhko (1953-1958), Reiss & Reiss (1969, 1972b, 1973) and Reiss & Schulte (1968) extended our knowledge on this group especially for western Anatolia, while Naumann & Naumann (1980) were the first to list and discuss the complete burnet moths (*Zygaena* Fabricius, 1775) fauna of northern and eastern Anatolia. They recorded 24 species including 3 new records (*Z. sedi* Fabricius, 1775, *Z. fraxini* Ménétriés, [recte *Z. peschmerga* Eckweiler & Görgner, 1982], *Z. cynarae* (Esper, 1789)) at that time. Later, *Z. turkmenica* Reiss, 1933 *Z. haematina* Kollar, [1849], *Z. mana* Kirby, 1892 and *Z. nevadensis* Rambur, 1858 were added (Görgner & Hofmann 1982, Reiss 1981, Lambert & Naumann 1992, Hofmann & Tremewan 2017). The complete inventory of burnet moths, their origin and ecological reference, refugia and endemics were currently listed by Hofmann & Tremewan (2017).

Currently, there are 56 Zygaenidae species recognized in Türkiye; 24 of which belong to Procridinae, and 32 species belong to Zygaeninae. Among these, five species are endemic to Türkiye: *Jordanita* (*Jordanita*) *chloronota* (Staudinger,1871), *Zygaena* (*Agrumenia*) *formosa* (Herrich-Schäffer, 1852), *Zygaena* (*Agrumenia*) *peschmerga* Eckweiler & Gorgner, 1981, *Zygaena* (*Mesembrynus*) *lydia* Staudinger, 1887, and *Zygaena* (*Zygaena*) *problematica* Naumann, 1966 (Efetov *et al.* 2010a, 2010b, 2019, Hofmann & Tremewan, 2017, Can Cengiz *et al.* 2018, Okyar *et al.* 2018, Can *et al.* 2019, Ulaşlı *et al.* 2021).

Identification of endemic and other zygaenid species, and the determination of their distribution are both crucial for the understanding, and the conservation of the Turkish fauna. This study aims to contribute to the knowledge Zygaenidae fauna in Türkiye which will provide a baseline for future conservation studies.

Materials and Methods

In recent years, some studies have been carried out to determine the Zygaenidae species of different regions of Türkiye. (Can Cengiz *et al.* 2012, 2018, 2019, Ulaşlı & Can 2021). In this study, both additional records were made from these regions and provincial records were given years after from the eastern Anatolia region. It is especially important to update the records of endemic species. In this study, most of the specimens were collected by the authors in different localities of Türkiye using sweep net at different altitudes with different climatic conditions, plant cover and surface features in Muğla, Denizli and Uşak in the Aegean region; in Ardahan, Erzincan, Kars and Erzurum provinces that are in the eastern Anatolia and İstanbul, Çanakkale, Kırklareli, Edirne and Tekirdağ from the Thrace region of Türkiye from May 2020 to September 2021. Some zygaenid species were observed and photographed in the field. The identification of the specimens, terminology, classification, and nomenclature of morphological structures are based on Hofmann & Tremewan (1996), Naumann *et al.* (1999), Hofmann & Tremewan (2017) and Hofmann & Tremewan (2020). Collected specimens were dissected in the laboratory, with the genitalia embedded in entellan on slides, following standard procedures. Genitalia slides were viewed using an

Olympus SZ40 microscope and photographs were taken with Canon EOS50D and the species identifications were confirmed by Prof. Dr. Konstantin Efetov (Crimea), Prof. Dr. Gerhard M. Tarmann (Austria) and Mr. Axel Hofmann (Germany). All specimens ae deposited in the Museum of Hatay Mustafa Kemal University, Hatay, Türkiye. Field observations were undertaken in 132 localities of 12 provinces of three different regions in Türkiye are coded as follows (See Fig.1 for the map):

A - Aegean Region

A1 Muğla, Dağdibi Vill., 37°10'28"N, 28°15'17"E, 579m.

A2 Muğla, Yeniköy-I, 37°08’31”N, 28°12’16”E, 700m.

A3 Muğla, Meke I, 37°08’23”N, 28°09’31”E, 707m.

A4 Muğla, Meke II, 37°06’51”N, 28°07’28”E, 1170m.

A5 Muğla, Pınaraltı, 37°04’41”N, 28°02’46”E, 530m.

A6 Muğla, Ören, 37°04’12”N, 27°59’42”E, 60m.

A7 Muğla, Ula, 37°06’47”N, 28°23’18”E, 610m.

A8 Muğla, Yukarımazı, 37°02’47”N, 27°42’03”E, 340m.

A9 Muğla, İncir, 37°06’26”N, 28°28’25”E, 560m.

A10 Muğla, Yeşilüzümlü-Ortaköy, 36°43’29”N, 29°15’50”E, 630m.

A11 Denizli, Citycenter (Eskihisarintersection), 37°49’33”N, 29°06’34”E, 293m.

A12 Denizli, Honaz National Park, 37°44’54”N, 29°16’31”E, 740m.

A13 Denizli, Mahmutgazi Değirmendere, 38°02’54”N, 29°26’25”E, 798m.

A14 Denizli, Selcen, 38°06’00”N, 29°19’04”E, 968m.

A15 Uşak, Güllü, 38°16’45”N, 29°07’37”E, 550m.

A16 Denizli, Kızılyer, 37°46’13”N, 29°19’58”E, 520m.

A17 Uşak, Kıranköy, 38°22’22”N, 29°11’19”E, 706m.

A18 Uşak, Ulubey, 38°27’01”N, 29°18’11”E, 785m.

A19 Uşak, Uşak University Campus, 38°40’24”N, 29°20’09”E, 920m.

A20 Uşak, Kaplıca, 38°38’19”N, 29°03’02”E, 583m.

A21 Uşak, Cemalçavuş, 38°34’22”N, 29°01’54”E, 750m.

A22 Uşak, Dumanlar, 38°28’56”N, 28°58’41”E, 932m.

A23 Uşak, Yeşilkavak, 38°19’41”N, 28°58’42”E, 690m.

A24 Denizli, Güney Yenikonak Vill., 38°12’14”N, 29°06’12”E, 736m.

A25 Denizli, Mecidiye, 37°54’34”N, 29°37’42”E, 1270m.

A26 Muğla, Algı, 37°08’26”N, 28°15’32”E, 718m.

A27 Muğla, Yeniköy-II, 37°08’01”N, 28°10’43”E, 540m.

A28 Muğla, Çırpı, 37°12’08”N, 28°08’24”E, 852m.

A29 Muğla, Çetibeli, 37°00’03”N, 28°18’13”E, 89m.

A30 Muğla, Muratlar, 37°10’52”N, 28°36’49”E, 895m.

A31 Denizli, Kale, Soğuksu, 37°26’04”N, 28°52’13”E, 1120m.

A32 Uşak, Sivaslı, Akarca, 38°34’13”N, 29°35’05”E, 875m.

A33 Denizli, Çivril, 38°20’11”N, 29°44’28”E, 1023m.

A34 Denizli, Citycenter, 37°38’41”N, 29°13’10”E, 1116m.

A35 Denizli, Tavas, 37°25’10”N, 28°50’25”E, 999m.

A36 Muğla, Ortaköy, 37°10’34”N, 28°25’28”E, 640m.

A37 Uşak, Banaz, Kızılcasöğüt, 38°37’17”N, 29°39’42”E, 980m.

A38 Uşak, Sivaslı, Erice, 38°34’25”N, 29°38’56”E, 865m.

A39 Uşak, Sivaslı, Yenierice, 38°32’31”N, 29°38’36”E, 858m.

A40 Uşak, Banaz, 38°41’11”N, 29°40’00”E, 997m.

A41 Uşak, Banaz, Yeşilyurt, 38°47’38”N, 29°43’55”E, 1025m.

A42 Uşak, Banaz, Küçükoturak, 38°49’46”N, 29°42’53”E, 1120m.

A43 Uşak, Banaz, Çamsu, 38°50’07”N, 29°37’52”E, 108m.

A44 Uşak, Merkez, Çamyuva, 38°49’16”N, 29°33’35”E, 1250m.

B - Eastern Anatolia Region

B1 Erzincan, Reşadiye, City Center, 39°53’00”N, 38°51’00”E, 1686m.

B2 Erzincan, Ahmetli, Gümüşhane road, 39°52’00”N, 39°20’00”E, 2045m.

B3 Erzincan, Bozçalı, 39°42’00”N, 38°36’00”E, 1400m.

B4 Erzurum, 39°16’17”N, 41°35’50”E, 2111m.

B5 Erzurum, 39°25’12”N, 41°35’53”E, 1807m.

B6 Erzurum, 39°53’7”N, 41°39’7”E, 1813m.

B7 Erzurum, 39°55’14”N, 40°29’26”E, 1963m.

B8 Erzurum, 40°9’4”N, 40°59’19”E, 2167m.

B9 Erzurum, 40°20’21”N, 41°37’6”E, 1989m.

B10 Kars, 40°26’47”N, 42°33’19”E, 2161m.

B11 Erzurum, 40°39’48”N, 41°1’51”E, 1739m.

B12 Ardahan, 41°29’0”N, 42°40’7”E, 1818m.

B13 Ardahan, 41°31’45”N, 42°36’4”E, 2178m.

B14 Ardahan, 41°14’20”N, 43°5’4”E, 1875m.

B15 Ardahan, 41°7’31”N, 42°46’53”E, 1818m.

B16 Ardahan, 41°1’7”N, 42°25’6”E, 2067m.

C - Thrace Region

C1 İstanbul, Çiftalan, 41°14’13”N, 28°54’25”E, 178m.

C2 İstanbul, Çatalca, Kadıköy, 41°09’41”N, 28°21’34”E, 185m.

C3 İstanbul, Yolçatı, 41°08’30”N, 28°08’57”E, 151m.

C4 Tekirdağ, Karamehmet, 41°17’13”N, 27°47’11”E, 180m.

C5 Tekirdağ, Kumbağ, 40°51’04”N, 27°27’07”E, 191m.

C6 Tekirdağ, Uçmakdere, 40°49’40”N, 27°23’46”E, 382m.

C7 Tekirdağ, Mürefte, 40°43’53”N, 27°19’35”E, 67m.

C8 Çanakkale, Gelibolu-Kilitbahir, 40°09’40”N, 26°22’22”E, 75m.

C9 Çanakkale, Eceabat, 40°13’09”N, 26°24’46”E, 55m.

C10 Çanakkale, Evreşe, 40°38’39”N, 26°50’58”E, 60m.

C11 Edirne, Karamahmut, 40°42’52”N, 26°45’17”E, 310m.

C12 Edirne, Keşan Barajı, 40°43’05”N, 26°25’50”E, 60m.

C13 Edirne, Enez, 40°43’36”N, 26°07’02”E, 78m.

C14 Edirne, Karapınar, Uzunköprü, 41°06’30”N, 26°38’26”E, 77m.

C15 Edirne, Kırcasalih, 41°17’50”N, 26°41’44”E, 86m.

C16 Edirne, Karaağaç, 41°39’28”N, 26°32’00”E, 99m.

C17 Kırklareli, Üsküp, 41°41’52”N, 27°20’19”E, 268m.

C18 Kırklareli, Hacıfakı-I, 41°43’41”N, 27°25’43”E, 360m.

C19 Kırklareli, Hacıfakı-II, 41°43’31”N, 27°27’04”E, 336m.

C20 Kırklareli, Kaynarca, 41°41’42”N, 27°28’54”E, 300m.

C21 Kırklareli, Hoyralı, 41°37’32”N, 27°35’05”E, 304m.

C22 Kırklareli, Yenice I, 41°44’54”N, 27°40’14”E, 761m.

C23 Kırklareli, Yenice II, 41°46’33”N, 27°41’58”E, 650m.

C24 Kırklareli, Demirköy, 41°51’40”N, 27°48’49”E, 421m.

C25 Kırklareli, İğneada, 41°52’31”N, 27°58’31”E, 72m.

C26 Edirne, Havsa, Necatiye, 41°30’40”N, 26°52’48”E, 175m.

C27 Kırklareli, Babaeski, Taşköprü, 41°27’17”N, 27°02’32”E, 103m.

C28 Kırklareli, Alpullu, 41°23’05”N, 27°09’16”E, 87m.

C29 Tekirdağ, Hayrabolu, 41°13’08”N, 27°07’01”E, 70m.

C30 Tekirdağ, Velimeşe, 41°14’22”N, 27°53’06”E, 181m.

C31 Kırklareli, Lüleburgaz, Sakızköy, 41°24’48”N, 27°30’21”E, 90m.

C32 Kırklareli, Pınarhisar, Ataköy, 41°36’16”N, 27°27’23”E, 150m.

C33 Kırklareli, Pınarhisar, 41°38’14”N, 27°29’51”E, 177m.

C34 Kırklareli, Pınarhisar, Kaynarca, 41°40’51”N, 27°27’14”E, 207m.

C35 Kırklareli, Karıncak, 41°39’54”N, 27°25’05”E, 225m.

C36 Kırklareli, Beypınar I, 41°46’44”N, 27°29’39”E, 580m.

C37 Kırklareli, Beypınar II, 41°47’45”N, 27°30’21”E, 565m.

C38 Kırklareli, Çukurpınar, 41°51’22”N, 27°28’31”E, 620m.

C39 Kırklareli, Demirhan, Armutveren, 41°54’25”N, 27°32’47”E, 408m.

C40 Kırklareli, Karadere, 41°55’28”N, 27°26’48”E, 466m.

C41 Kırklareli, Dereköy, 41°56’10”N, 27°21’18”E, 470m.

C42 Kırklareli, Geçitağı, 41°57’10”N, 27°17’47”E, 557m.

C43 Kırklareli, Kofçaz, Kula, 41°59’50”N, 27°17’44”E, 531m.

C44 Kırklareli, Kofçaz, Kocayazı, 41°58’12”N, 27°12’40”E, 670m.

C45 Kırklareli, Kofçaz, Kadıköy, 41°49’53”N, 27°10’57”E, 260m.

C46 Edirne, Trakya University Campus, 41°38’46”N, 26°37’20”E, 65m.

C47 Edirne, Kayapa, 41°46’50”N, 26°40’42”E, 120m.

C48 Edirne, Muratçalı, 41°48’10”N, 26°37’26”E, 148m.

C49 Edirne, Çömlek, 41°50’44”N, 26°36’44”E, 116m.

C50 Edirne, Saksağan, 41°53’12”N, 26°35’36”E, 134m.

C51 Edirne, Demirköy, 41°53’12”N, 26°39’50”E, 321m.

C52 Edirne, Hanlıyenice, 41°52’39”N, 26°41’06”E, 255m.

C53 Edirne, Lalapaşa, 41°51’49”N, 26°45’34”E, 252m.

C54 Edirne, Vaysal, 41°55’06”N, 26°50’25”E, 511m.

C55 Edirne, Süleymandanişment, 41°53’33”N, 26°53’24”E, 38m.

C56 Edirne, Ömeroba, 41°54’28”N, 26°57’22”E, 335m.

C57 Edirne, Çeşmeköy, 41°52’46”N, 26°59’28”E, 320m.

C58 Edirne, Karahamza, 41°50’13”N, 26°59’49”E, 247m.

C59 Edirne, Küküler, 41°43’44”N, 26°54’01”E, 134m.

C60 Edirne, Necatiye, 41°29’49”N, 26°55’32”E, 57m.

C61 Edirne, Yolageldi, 41°30’05”N, 27°00’45”E, 69m.

C62 Edirne, Demirkapı, 41°34’05”N, 27°00’45”E, 79m.

C63 Edirne, Dokuzhöyük, 41°38’54”N, 27°03’57”E, 95m.

C64 Edirne, Süloğlu, Büyükgerdelli, 41°44’21”N, 26°56’47”E, 153m.

C65 Kırklareli, İnece, 41°40’10”N, 27°03’55”E, 132m.

C66 Kırklareli, Kızılcıkdere, 41°41’52”N, 27°20’14”E, 210m.

C67 Kırklareli, Üsküp, 41°43’35”N, 27°25’56”E, 305m.

C68 Kırklareli, Pınarhisar, Hacıfaklı, 41°41’43”N, 27°28’59”E, 258m.

C69 Kırklareli, Pınarhisar, Poyralı, 41°37’29”N, 27°35’25”E, 247m.

C70 Kırklareli, Vize, Soğucak, 41°38’49”N, 27°39’23”E, 307m.

C71 Kırklareli, Vize, Sergen, 41°40’57”N, 27°41’03”E, 384m.

C72 Kırklareli, Vize, Soğucak, 41°37’28”N, 27°38’40”E, 271m.

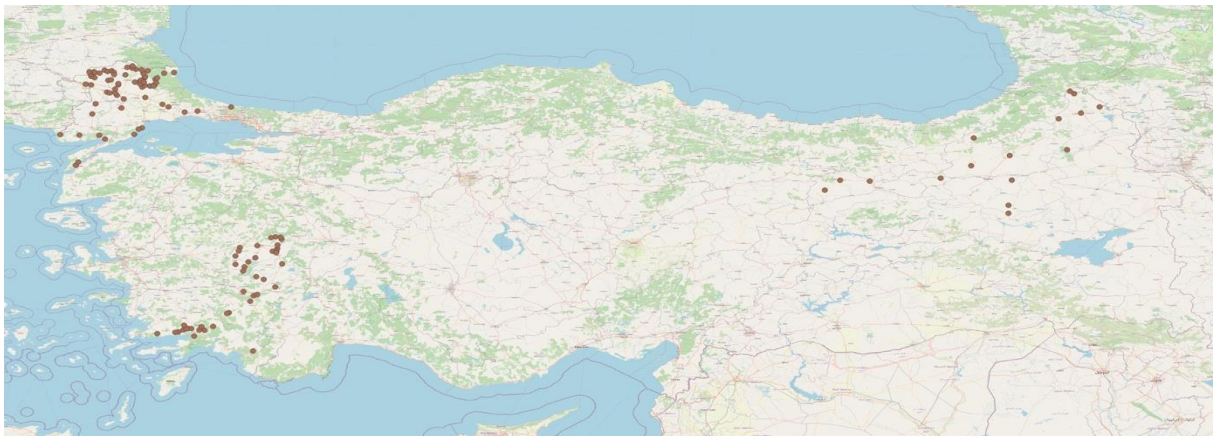

Fig.1. The localities where zygaenid moths were sampled during the study.

Results

In the present study, the results of the identification of zygaenid moths collected or photographed at 49 out of 132 localities in 12 provinces of the Aegean, eastern Anatolia and Thrace regions of Türkiye are presented (Fig. 1). 20 species belonging to five genera and within two subfamilies were identified.

Order LEPIDOPTERA
Family Zygaenidae Latreille
Subfamily Procridinae Boisduval

Theresimima ampellophaga (Bayle-Barelle, 1808): **C11**, 29.VI.2021, 1♂, leg. B. Ulaşlı.

Rhagades (*Wiegelia*) *amasina* (Herrich-Schäffer, 1851): **A1**, 13.VI.2020, 1♀, leg. F. Can; **A7**, 19.V.2020, 3♂♂, 1♀, leg. F. Can; **A37,** 06.VII.2020, 1♀, leg. F. Can; **C12**, 29.VI.2021, 1♂, leg. F. Can.

Adscita (*Adscita*) *statices drenowskii* (Alberti, 1939): **A21**, 24.V.2020, 3♂♂, leg. F. Can.

Jordanita (*Tremewania*) *notata* (Zeller, 1847): **A17**, 24.V.2020, 3♂♂, 1♀, leg. F. Can.

Jordanita (*Jordanita*) *graeca* (Jordan, 1907): **A20**, 24.V.2020, 1♂, 1♀, leg. F. Can.

Jordanita (*Jordanita*) *chloros* (Hübner, 1813): **C14**, 29.VI.2021, 1♀, leg. F. Can.

Jordanita (*Praviela*) *anatolica* (Naufock, 1929): **A2**, 19.V.2020, 1♂, leg. F. Can; **A24**, 27.V.2020, 1♂, leg. F. Can; **C11**, 29.VI.2021, 1♂, 2♀, leg. B. Ulaşlı; **C21**, 30.VI.2021, 4♂♂, 1♀, leg. F. Can.

Jordanita (*Solaniterna*) *subsolana* (Staudinger, 1862): **A8**, 21.V.2020, 6♂♂, leg. F. Can; **B1** 07.VII.2021, 4♂♂, leg. M. Ö. Koyuncu.

Subfamily Zygaeninae Fabricius, 1775

Zygaena (*Agrumenia*) *armena* Eversman, 1851 (Fig. 4): **B12**, 31.VII.2021, 02. VIII.2021, photo: E. Karaçetin; **B13**, 03.VIII.2021, photo: E. Karaçetin.

Zygaena (*Agrumenia*) *carniolica* (Scopoli, 1763) (Fig. 2): **A37**, 06.VII.2020, 6♂♂, leg. F. Can; **A38,** 06.VII.2020, 1♂, leg. F. Can; **B10**, 18.VII.2021, photo: E. Karaçetin; **B14,** 08. VIII.2021, photo: E. Karaçetin; **C5**, 28.VI.2021, 6♂♂, leg. F. Can; **C11**, 29.VI.2021, 4♂♂, 1♀, leg. F. Can; **C12**, 29.VI.2021, 1♂, 2♀, leg. B. Ulaşlı; **C20**, 30.VI.2021, 1♂, 1♀, leg. B. Ulaşlı; **C70**, 15.VII.2021, 1♂, leg. S. Akar; **C71**, 15.VII.2021, 1♂, 1♀, leg. S. Akar.

Zygaena (*Agrumenia*) *loti* ([Denis & Schiffermüller], 1775) (Fig. 3): **A25**, 28.V.2020, 2♀, leg. F. Can; **A31**, 18.VI.2020, 1♂, leg. F. Can; **A35**, 20.VI.2020, 1♂, leg. F. Can; **B8**, 13.VII.2021, photo: E. Karaçetin; **B9**, 14.VII.2021, photo: E. Karaçetin; **C11**, 29.VI.2021, 1♂, 1♀, leg. F. Can; **C12**, 29.VI.2021, 1♂, 1♀, leg. F. Can; **C20**, 30.VI.2021, 4♂♂, leg. F. Can.

Zygaena (*Agrumenia*) *olivieri* Boisduval, 1828: **A37**, 06.VII.2020, 4♂♂, leg. F. Can**; B6**, 09.VII.2021, photo: E. Karaçetin.

Zygaena (*Mesembrynus*) *diaphana* Staudinger, 1887 [Z. (*M.*) *minos* ([Denis &Schiffermüller], 1775)]: **A2**, 21.V.2020 1♀, leg. F. Can; **B12**, 31.VII.2021, photo: E. Karaçetin.

Zygaena (*Mesembrynus*) *laeta* (Hübner, 1790): **A37**, 06.VII.2020, 1♀, leg. B. Ulaşlı; **C11**, 29.VI.2021, 1♂, leg. F. Can; **C11**, 29.VI.2021, 1♂, leg. F. Can; **C12**, 29.VI.2021, 1♂, 3♀, leg. F. Can; **C71**, 15.VII.2021, 1♂,1♀, leg. S. Akar.

Zygaena (*Mesembrynus*) *lydia* Staudinger, 1887: **B2**, 08.VII.2021, 3♂♂, leg. M. Ö. Koyuncu.

Zygaena (*Mesembrynus*) *punctum* Ochsenheimer, 1808: **A1**, 13.VI.2020, 1♀, leg. F. Can; **A2**, 13.VI.2020, 1♂, 1♀, leg. F. Can; **A7**, 13.VI.2020, 2♀, leg. F. Can; **A32**, 20.VI.2020, 3♂♂, 1♀, leg. F. Can; **A37**, 06.VII.2020, 5♂♂, leg. F. Can; **A39**, 06.VII.2020, 1♂, leg. F. Can; **A40**, 06.VII.2020, 6♂♂, leg. F. Can; **A41**, 06.VII.2020, 3♂♂, leg. F. Can; **A44**, 06.VII.2020, 4♂♂, leg. F. Can; **C4**, 28.VI.2021, 1♂, leg. F. Can; **A20,** 24.V.2021, 19♂♂, 1♀, leg. F. Can; **C5**, 28.VI.2021, 9♂♂, leg. F. Can; **C6**, 28.VI.2021, 8♂♂, 2♀, leg. F. Can; **C11**, 29.VI.2021, 1♂, leg. F. Can.

Fig. 2. *Zygaena (Agrumenia) carniolica*. Edirne, Karamahmut, 40°42’52” N; 26°45’17” E, 310 m. Photo: F. Can.

Zygaena (*Zygaena*) *dorycnii* Ochsenheimer, 1808 (Fig. 5): **B3**, 07.VII.2021, 1♂, 1♀, leg. M. Koyuncu; **B4**, 08.VII.2021, photo. E. Karaçetin; **B5**, 08.VII.2021, photo: E. Karaçetin; **B7**, 11.VII.2021, photo: E. Karaçetin; **B8**, 13.VII.2021, photo: E. Karaçetin; **B9**, 14.VII.2021, photo: E. Karaçetin; **B11**, 30.VII.2021, photo: E. Karaçetin; **B12**, 31.VII.2021, photo: E. Karaçetin; **B13**, 03.VIII.2021, photo: E. Karaçetin; **B15**, 05.VIII.2021, photo: E. Karaçetin; **B16**, 05.VIII.2021, photo: E. Karaçetin.

Zygaena (*Zygaena*) *ephialtes* (Linnaeus, 1767) (Fig. 6): **A34**, 20.VI.2020, 2♂♂, leg. F. Can; **C71**, 15.VII.2021, 1♂, 1♀, leg. S. Akar.

Zygaena (*Zygaena*) *filipendulae* (Linnaeus, 1758): **A26,** 17.VI.2020, 1♂, 1♀, leg. F. Can; **A34**, 20.VI.2020, 1♂, leg. F. Can; **A44**, 06.VII.2020, 1♂, leg. F. Can; **B9**, 14.VII.2021, 15.VII.2021, photo: E. Karaçetin; **B11**, 27.VII.2021, 31.VII.2021, photo: E. Karaçetin; **B12**, 31.VII.2021, photo: E. Karaçetin; **C1**, 28.VI.2021, 5♂♂, 1♀, leg. F. Can; **C2**, 28.VI.2021, 1♂, leg. F. Can; **C11**, 29.VI.2021, 7♂♂, leg. F. Can; **C23**, 30.VI.2021, 1♂, leg. F. Can; **C71**, 15.VII.2021, 2♂♂, leg. S. Akar.

Zygaena (*Zygaena*) *lonicerae* (Scheven, 1777): **B9**, 15.VII.2021, photo: E. Karaçetin; **B10**, 17.VII.2021, photo: E. Karaçetin; **B12**, 01.VIII.2021, photo: E. Karaçetin.

Fig.3. *Zygaena* (*Agrumenia*) *loti*. Kırklareli, Kaynarca, 41°41’42” N; 27°28’54” E, 300 m. Photo: F. Can.

Fig.4. *Zygaena* (*Agrumenia) armena*. Ardahan, 41°29’0” N; 42°40’70” E, 1818 m. Photo: E. Karaçetin.

Fig.5. *Zygaena* (*Zygaena*) *dorycnii*. Ardahan, 41°01’07” N; 42°25’06” E, 2067 m. Photo: E. Karaçetin.

Fig. 6. *Zygaena ephialtes chalkidikae*. Kırklareli, Sergen, Vize, 41°40’57” N; 27°41’03” E, 384 m, scale bar: 0.5 mm. Photo: S. Akar.

Discussion

Türkiye has an extraordinarily rich biodiversity with approximately 12,000 plant species (Güner 2014) and unknown number of insect species. Everyday new species are being introduced to the scientific community and more of the research in Türkiye is therefore oriented towards taxonomic studies. However, in a world where biodiversity is in dire crisis, more work is needed for protecting the nature and its biodiversity. Studies like systematic and regular observations of species, producing distribution maps, identifying rare/endemic species and their localities, and identifying their threats are increasingly becoming more important so that a basis for protection of species can be established.

Zygaenidae species are among the well-studied group of moths in Lepidoptera. The species of the Zygaenidae family are excellent indicators of environmental conditions (Efetov, 2005) and a decline in their population size is often a consequence of degradation their habitats due to land-use, intensification of agriculture, and recently, the global climate change (Hofmann and Tremewan, 2017). In the book prepared about the Zygaenidae species in the western palearctic region, the systematic features, life cycles, ecological demands, genetic and behavioral characteristics of the Zygaenidae family are explained in detail (Naumann *et al.* 1999). Hoffmann and Tremewan published the systematic catalog of the Zygaeninae subfamily (1996). In addition, new species in the genus Zygaena were also identified in the neighboring country Iran (Tremewan 1979, Hofmann 2000, Hofmann & Kia-Hofmann 2008, Hofmann & Tremewan 2001, Hofmann & Tremewan 2003). The production of the distribution maps of zygaenid species is an ongoing process. *Biooffice* software has been used for generating the distribution maps of zygaenid species all over the world. This software has been used to create the maps for 13,000 different species from the Alps in the Tyrol region, in addition to the Zygaenidae species in Iran and Procridinae species in the western palearctic region (Tarmann 2010). However, in Türkiye, studies on the Zygaenidae family are very limited with fewer visits and large gaps on the distribution map are present. This study aims to partly fill this gap on the zygaenid species records by reporting the new data collected within 132 localities in 12 provinces of the Aegean, eastern Anatolia and Thrace regions of Türkiye during the subsequent field studies carried out in 2020 and 2021. In this study we recorded thirteen species from the Aegean, 10 species from the eastern Anatolia, 10 species from the Thrace provinces (Table 1). A total of 20 species were recorded during the fieldwork.

The family Zygaenidae also comprises some pest species (Tarmann, 2003). The vine bud moth, *Theresimima ampellophaga* (Bayle-Barelle, 1808), whose larvae feed on the leaves of *Vitis vinifera*, *Parthenocissus vitacea* and *P. quinquefolia*, have been considered an important pest for wine production. Other examples to pests from Zyganidae family are *Rhagades* (*Wiegelia*) *amasina* (Herrich-Schäffer, 1851) and *Rhagades (Rhagades) pruni* (Denis & Schiffermüller, 1775). *Rhagades amasina*, whose larvae feed on *Prunus* and *Crataegus* species, is known from Bulgaria, Greece, Türkiye, northern Syria and Lebanon. *Rhagades pruni* is a pest of *Vaccinium uliginosum*, *Calluna vulgaris* and *Andromeda polifolia* and found in most of Europe (except for the British Isles) up to East Asia, including Japan. Among these three pest species we recorded two of them in Aegean and Trace provinces. We recorded a male *T. ampellophaga* in Edirne, Karamahmut, in end of July of 2021. It was not present in any other locations we visited. The other pest, *R. amasina*, was collected from four different locations in three provinces: Dağdibi Village and Ula (Muğla), Keşan Dam (Edirne) and Çukurpınar (Kırklareli). Its flight period changes from mid May to end of June depending on the elevation.

Except from the two pest species, all other species of zygaenids recorded during this study are specialized in natural areas. None of the species are listed under the IUCN threatened species categories, not because they are not threatened but their threat categories have not been evaluated and assigned. In particular, local and rare species might be endangered as many human activities are present in their natural habitats. One local and rare species recorded in this study is *Zygaena* (*Agrumenia) armena*, which was recorded in Ardahan in only two different locations. The distribution of this moth species includes a rather narrow range in Transcaucasia, in a very restricted region in Georgia and Ardahan (Türkiye). Its foodplant is reported as *Securigera varia* and its habitats are identified as forest clearings and old tracks with herbaceous margins (Hoffman & Tremewan, 2020). During the fieldwork, the species was recorded in forest clearings within broad-leaved forests in Ardahan (Fig. 7). Two major human activities in its natural habitats were forestry and cattle grazing. Although it is believed that a level of grazing is required to keep the forest openings stay open, overgrazing might lead to degradation of plant structure leading to the decline in population size of the moth. Therefore, it is recommended that the local grazing activities should be managed. Also, in one of its locations, the habitat was plowed, and pine trees were planted for forestry purposes, which might lead to future population decline for this species.

Fig. 7. The habitat of *Zygaena armena* in Ardahan (**B12**, 31.VII.2021)

Table 1. Distribution of the zygaenid species identified in three different regions of Türkiye in the recent years. Asterix (*) means that endemic species to the eastern Anatolia region of Türkiye.

	A-Aegean	B-Eastern Anatolia	C-Thrace
PROCRIDINAE			
Adscita (*Adscita*) *statices drenowskii*	+	-	-
Jordanita (*Jordanita*) *chloros*	-	-	+
Jordanita (*Jordanita*) *graeca*	+	-	+
Jordanita (*Praviela*) *anatolica*	+	-	-
Jordanita (Solaniterna) subsolana	-	+	-
Jordanita (*Tremewania*) *notata*	+	-	-
Rhagades (*Wiegelia*) *amasina*	+	-	+
Theresimima ampellophaga -		-	+
ZYGAENINAE			
Zygaena (*Agrumenia*) *armena*	-	+	-
Zygaena (*Agrumenia*) *carniolica*	+	+	+
Zygaena (*Agrumenia*) *loti*	+	+	+
Zygaena (*Agrumenia*) *olivieri*	+	+	-
Zygaena (*Mesembrynus*) *diaphana*	+	+	-
Zygaena (*Mesembrynus*) *laeta*	+	-	+
Zygaena (*Mesembrynus*) *lydia*	-	+	-
Zygaena (*Mesembrynus*) *punctum*	+	-	+
Zygaena (*Zygaena*) *dorycnii*	-	+	-
Zygaena (*Zygaena*) *ephialtes*	+	-	+
Zygaena (*Zygaena*) *filipendulae*	+	+	+
Zygaena (*Zygaena*) *lonicerae*	-	+	-

In this study, we also had a chance to correct a mistake of a historical record. During the study, a specimen of *Zygaena ephialtes chalkidikae* Holik, 1937 (ephialtoid, 5-spotted, red) was collected from the European side of Türkiye (in Kırklareli province) (Fig. 5). Historically, a red coloured peucedanoid specimen published from the European side of Istanbul was listed as *Zygaena dorycnii* in Herrich-Schäffer, 1845. As the natural distribution of *Z. dorycnii* does not include western Türkiye, this historical specimen should have been misidentified as *Z. dorycnii* and instead it should be *Z. ephialtes wagneriana*, the only peucedanoid, 6-spotted, red specimen with red cingulum we recorded in this region. However, a caution is still warranted as this was 200 years ago, and in the meantime the distribution boundaries of the different subspecies may have changed (Gerhard M. Tarmann, personal communication: February 25, 2022).

Overall, this paper reports the zygaenids from 12 provinces in the Aegean, eastern Anatolia, and Thrace regions of Türkiye, the first record of *Z. ephialtes* in Thrace region of Türkiye since Herrich-Schäffer (1845), current records of *Z. lydia*, an endemic species to Türkiye, and new localities of the restricted ranged species *Z. armena*.

Acknowledgement

The authors are grateful to Prof. Dr. Konstantin Efetov (Crimea), Prof. Dr. Gerhard M. Tarmann (Austria) and Mr. Axel Hofmann (Germany) for their valuable comments, editing, and help. We wish to express our thanks to Mürşit Ömür Koyuncu (Gaziantep, Türkiye) for his records of *Jordanita subsolana, Zygaena lydia and Z. dorycnii*, Kaan Yılmaz and Mustafa Durmuş for their help in the fieldwork and Jethro Bell for reviewing the article and correcting grammatical errors. We are also thankful to the reviewers for their valuable comments.

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Author Contributions: All authors contributed equally to this manuscript in its all stages.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study has received no financial support.

References

1. Alberti, B. 1954. Über die stammesgeschichtliche Gliederung der Zygaenidae nebst Revision einiger Gruppen (Insecta, Lepidoptera). *Mitteilungen aus dem Zoologischen Museum der Humboldt-Universität Berlin,* 30: 115-480.
2. Alberti, B. 1958. Über den stammesgeschichtlichen Aufbau der Gattung *Zygaena* ihrer Vorstufen (Insecta, Lepidoptera). *Mitteilungen aus dem Zoologischen Museum der Humboldt-Universität Berlin,* 34: 203-242.
3. Alberti, B. 1959. Über den stammesgeschichtlichen Aufbau der Gattung Zygaena F. und ihrerVorstufen (Insecta, Lepidoptera). *Mitteilungen aus dem Zoologischen Museum der Humboldt-Universität Berlin*, 34: 245-396.
4. Can, F., Efetov, K.A., Burman, J., Kaya, K., Kucherenko, E.E., Ulaşlı, B. & Tarmann, G.M. 2019. A study of the Zygaenidae (Lepidoptera) fauna of Central Anatolia, Turkey. *Turkish Journal of Entomology* (*Türkiye Entomoloji Dergisi*), 43(2): 189-199.
5. Can Cengiz, F., Özsemerci, F., Karsavuran, Y. ve Subchev, M., 2012. *Theresimima ampellophaga* (Bayle-Barelle, 1808) in the Aegean region of Turkey (Lepidoptera: Zygaenidae; Procridinae), 3. Paper presented at the XIII. International Symposium on Zygaenidae, 16-23 September, Innsbruck, Tirol, Austria.
6. Can Cengiz, F., Efetov, K.A., Kaya, K., Kucherenko, E.E., Okyar, Z. & Tarmann, G.M. 2018. Zygaenidae (Lepidoptera) of Thrace Region of Turkey. *Nota Lepidopterologica*, 41(1): 23-36.
7. Çıplak, B. 2003. Distribution of Tettigoniinae (Orthoptera, Tettigoniidae) bush-crickets in Turkey: the importance of the Anatolian Taurus Mountains in biodiversity and implications for conservation. *Biodiversity and Conservation*, 12(1): 47-64.
8. Davis, P.H., Coode, M.J.E. & Cullen, J. 1965-1985. *Flora of Turkey and the East Aegean Islands*. 11 Volumes, University Press, Edinburgh.
9. Efetov, K.A. 1999. *Inouela* gen. n. from Japan and Taiwan (Lepidoptera: Zygaenidae, Chalcosiinae). *Entomologist's Gazette* 50(2): 91-95.
10. Efetov, K.A., 2005. *The Zygaenidae (Lepidoptera) of the Crimea and other regions of Eurasia*. CSMU Press, Simferopol, 420 pp.
11. Efetov, K.A., Mollet, B., Tarmann, G.M. 2010a. The biology and early stages of Adscita (*Adscita*) *capitalis* (Staudinger, 1879) (Lepidoptera: Zygaenidae, Procridinae). *Nachrichten des entomolgischen Vereins Apollo, N.F.*, 31(3): 119-125.
12. Efetov, K.A., Can, F., Toshova, T.B. & Subchev, M. 2010b. New sex attractant for *Jordanita anatolica* (Naufock) (Lepidoptera: Zygaenidae: Procridinae*). Acta Zoologica Bulgarica*, 62(3): 315-319.
13. Efetov, K.A., Hofmann, A., Tarmann, G.M. & Tremewan, W.G. 2014. Taxonomic comments on the treatment of the Zygaenidae (Lepidoptera) in volume 3 of *Moths of Europe*, Zygaenids, Pyralids 1 and Brachodids (2012). *Nota Lepidopterologica*, 37(2): 123-133.
14. Efetov, K.A., Kirsanova, A.V., Lazareva, Z.S., Parshkova, E.V., Tarmann, G.M., Rougerie, R. & Hebert P.D.N. 2019. DNA barcoding of Zygaenidae (Lepidoptera): results and perspectives. *Nota Lepidopterologica*, 42(2): 137-150.
15. Efetov, K.A., Lazareva, Z.S., Parshkova, E.V. & Tarmann, G.M. 2021. Molecular genetic characters of species of the genus *Jordanita* Verity, 1946 (Lepidoptera: Zygaenidae, Procridinae): DNA barcodes and corresponding amino acid sequences. *Russian Journal of Genetics*, 57(1): 61-69.

16. Efetov, K.A. & Tarmann, G.M. 2012. *A Checklist of the Palaearctic Procridinae (Lepidoptera: Zygaenidae)*. CSMU Press, Simferopol and Innsbruck, 108 pp.

17. Efetov, K.A. & Tarmann, G.M. 2014. *Illiberis* (*Alterasvenia*) *banmauka* sp. nov. (Lepidoptera: Zygaenidae, Procridinae) from China and Myanmar. *Entomologist's Gazette* 65(1): 62-70.

18. Efetov, K.A. & Tarmann, G.M. 2016. *Pseudophacusa multidentata* Efetov & Tarmann, a new genus and species of Procridini from Myanmar, China and Laos (Lepidoptera: Zygaenidae, Procridinae). *SHILAP Revista de lepidopterologia* 44(173): 81-89.

19. Efetov, K.A. & Tarmann, G.M. 2017. The hypothetical ground plan of the Zygaenidae, with a review of the possible autapomorphies of the Procridinae and the description of the Inouelinae subfam. nov. *Journal of the Lepidopterists' Society*, 71(1): 20-49.

20. Epstein, M.E. 1996. *Revision and Phylogeny of the Limacodidgroup Families, With Evolutionary Studies On Slug Caterpillars (Lepidoptera, Zygaenoidea).* Smithsonian Institution Press, Washingon D.C., 112 pp.

21. FAO, 2019. *Türkiye'nin Biyoçeşitliliği: Genetik Kaynakların Sürdürülebilir Tarım ve Gıda Sistemlerine Katkısı*. Ankara. 222 pp.

22. Görgner, E. & Hofmann, A. 1982. Eine neue Zygaenanartfür die Türkei (Lepidoptera; Zygaenidae, *Zygaena* Fabricious, 1775, Subgenus *Mesembrynus* Hübner [1819]). *Entomofauna* 3: 33-54.

23. Güner, A. 2014. *Resimli Türkiye Florası*. Nezahat Gökyiğit Botanik Bahçesi. Flora Araştırmaları Derneği ve Türkiye İş Bankası yayını, İstanbul. 761 pp.

24. Herrich-Schäffer, G.A.W. 1845: 1843-1855. Systematische Bearbeitung der Schmetterlinge von Europa, zugleich als Text, Revision und Supplement zu Jakob Hübner's Sammlung europäischer Schmetterlinge, 39 pp.

25. Hofmann, A., 2000. Contribution to the knowledge of the genus *Zygaena* Fabricious, 1775 in İran (Lepidoptera, Zygaenidae). Part I: Introduction, systematic part: *Zygaena (Mesembrynus) seitzi, Z. seitzi nocturna, Z. manlia.* Linneana Belgica, Wetteren 17: 171-196.

26. Hofmann, A. & Kia-Hofmann, T., 2008. Contribution to the knowledge of the genus *Zygaena* Fabricious, 1775 in İran (Lepidoptera, Zygaenidae). Part VIII: Bionomics of high-mountain species in the Alborz Mountains and adjacent areas (Introductions: *Z. speciosa, Z. cacuminum*). *Nota Lepidopterologica*, 31(1): 25-52.

27. Hofmann, A. &Tremewan, W.G. 1996. *A Systematic Catalogue of the Zygaeninae (Lepidoptera: Zygaenidae*). Harley Books, Colchester, 251 pp.

28. Hofmann, A. & Tremewan. W. G., 2001. Contribution to the knowledge of the genus *Zygaena* Fabricious, 1775 in İran (Lepidoptera, Zygaenidae). Part V: *Zygaena tamara.* Linneana Belgica, Wetteren 18: 125-136.

29. Hofmann, A. & Tremewan. W. G. 2003. Contribution to the knowledge of the genus *Zygaena* Fabricious, 1775 in İran (Lepidoptera, Zygaenidae). Part VI: *Zygaena nocturna, Z. aisha, Z. rubricollis* and *Z. fredi.* Linneana Belgica, Wetteren 19: 9-20.

30. Hofmann, A. & Tremewan, W.G. 2017. *The Natural History of Burnet Moths, Part I.* Museum Witt Munich and Nature Research Center Vilnius. 630 pp.

31. Hofmann, A. & Tremewan, W.G. 2020. *The Natural History of Burnet Moths, Part II.* Museum Witt Munich and Nature Research Center Vilnius. 530-1095 pp.

32. Holik, O. & Sheljuzhko, L. 1953-1958. Über die Zygaenen-Fauna Osteuropas, Kleinasiens, Irans, Zentralasiens und Sibiriens. *Mitteilungen der Münchner Entomologischen Gesellschaft,* 42: 166-297.

33. Karaçetin, E., Welch, H.J., Turak, A., Balkız, Ö. & Welch, G. 2011. *Conservation Strategy of the Butterflies in Turkey*. Doğa Koruma Merkezi, Ankara, 125 pp.

34. Lambert, B. & Naumann, C. M. 1992. *Zygaena* (*Zygaena*) *nevadensis* Rambur, 1866 (Lepidoptera: Zygaenidae) new for the fauna of Turkey, pp. 184-186. In Dutreix, C., Naumann, C. M. & Tremewan, W. G. (Eds), Proceedings of the 4th Symposium on Zygaenidae, Nantes 11-13 September 1987. Recent advances in burnet moth research (Lepidoptera: Zygaenidae). *Theses Zoologicae* 19: 193 pp.

35. Mann, J.J. 1862. Verzeichniss der im Jahre 1851 bei Brussa in Kleinasien gesammelten Schmetterlinge, Tafel 3. *Wiener Entomologische Monatsschrift*, 6: 373-409.

36. Naumann, C.M., Tarmann, G.M. & Tremewan, W.G. 1999. *The Western Palaearctic Zygaenidae (Lepidoptera).* Stenstrup, 304 pp.

37. Naumann, S. & Naumann, C. M. 1980. Ein Beitrag zur Kenntnis der Zygaenen-Fauna Nord- und Ost-Anatoliens (Lep., Zygaenidae). *Entomofauna* 1: 302-353.

38. Okyar, Z., Efetov, K.A., Kaya, K., Tarmann, G.M. & Can, F. 2018. Preliminary list of the Zygaenidae (Lepidoptera) of Turkey, 37. Paper presented at the *XVI. International Symposium on Zygaenidae,* 1-5 May, İzmir, Turkey.

39. Reiss, G. 1981. *Zygaena* (*Mesembrynus*) *haematina* Kollar [1849] und ihre Verbreitung (Lep. Zygaenidae). *Atalanta*, 12: 368-385.

40. Reiss, H. & Reiss, G. 1969. Beitrag zur Verbreitung der *Zygaena* (*Agrumenia*) *ganymedes* H.-S., und der *Zygaena* (*A.*) *laetifica* H.-S. der *olivieri* Gruppe (Lep.). *Stuttgarter Beiträge zur Naturkunde.* 205: 1-7.

41. Reiss, H. & Reiss, G. 1972a. Beitrag zur Zygaenenfauna der Süd- und der Südostürkei (Lep., Zygaenidae). *Stuttgarter Beiträge zur Naturkunde*, 249: 1-6.

42. Reiss, H. & Reiss, G. 1972b. On two new races of the genus *Zygaena* Fabricius from Asia Minor (Lep., Zygaenidae). *The Entomologist's Record and Journal of Variation*, 84: 226-229.

43. Reiss, H. & Reiss, G. 1973. On the *Zygaena* Fauna of the Neighbourhood of Lake Van in Asia Minor (Lep., Zygaenidae). *The Entomologist's Record and Journal of Variation*,. 85: 191-196.

44. Reiss, H. & Schulte, A. 1968. On a new subspecies of *Zygaena* (*Agrumenia*) *ganymedes* Herrich-Schäffer (Lep., Zygaenidae). *The Entomologist's Record and Journal of Variation*, 80: 1-2.

45. Takhtajan, A., Crovello, T.J. & Cronquist, A. 1986. *Floristic regions of the world*, Vol. 544, University of California Press, Berkeley, 522 pp.

46. Tarmann, G.M. 1984. Generische Revision der amerikanischen Zygaenidae mit Beschreibung neuer Gattungen und Arten (Insecta: Lepidoptera). *Entomofauna*, Supplemantary, 2(1): 176 pp.

47. Tarmann, G.M. 1994. A preliminary review of the classification of the zygaenid subfamily Procridinae (Lepidoptera). *Nota Lepidopterologica*, 5: 115-123.

48. Tarmann, G.M. 2003. Zygaenidae as pest species, 151-229. Paper presented at the Proceedings of the 7th International Symposium on Zygaenidae (Lepidoptera), 4-8 September, Innsbruck, Autstria.

49. Tarmann, G.M., 2004. *Zygaenid moths of Australia*: *A revision of the Australian Zygaenidae (Procridinae: Artonini)*. CSIRO Publishing, Collingwood, 248 pp.

50. Tarmann, G.M. 2010. The long way to an electronic Zygaenidae data network - a report of five years of ups and downs. 1. Paper presented at the XII. International Symposium on Zygaenidae, 5-9 May, Hatay, Türkiye.

51. Tremewan, W.G. 1979. On *Zygaena* Fabricious, 1775 (Lepidoptera, Zygaenidae) from Iran. *Entomologist's Gazette, Brightwood* 30: 249-256.

52. Ulaşlı, B. & Can, F. 2021. Determination of Zygaenidae (Lepidoptera) species by morphological and molecular methods in the Eastern Mediterranean Region of Turkey. *Turkish Journal of Entomology*, (*Türkiye Entomoloji Dergisi*), 45(2): 255-268.

53. UN, 2020. Human Development Report. UNDP. https://hdr.undp.org/sites/default/files/hdr2020.pdf (Date accessed: 28 March 2022).

54. Warren, M.S., Maes, D., van Swaay, C.A.M., Goffart, P., van Dyck, H., Bourn, N.A.D., Wynhoff, I., Hoare, D. & Ellis, S. 2021. The decline of butterflies in Europe: Problems, significance, and possible solutions. *Proceedings of the National Academy of Sciences of the United States of America*, 118(2): 1-10.

55. Yen, S.-H. 2003. Phylogeny and systematics of the major lineages of Chalcosiinae s. l. (Zygaenidae s. l.), 293-348. Paper presented at the Proceedings of the 7th International Symposium on Zygaenidae, 4-8 September, Innsbruck, Austria.

56. Zeller, P.C. 1847. Verzeichniss der von Prof. Dr Loew in der Türkei und Asiengesammelten Lepidoptera. *Isis von Oken*, 40: 3-39.

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S65-S111, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1123152

Research Article
Special Issue: Biodiversity of Insects

AN UP-TO-DATE CHECKLIST OF TURKISH PENTATOMIDAE (HEMIPTERA: HETEROPTERA) WITH ADDITIONAL RECORDS

Meral FENT[1*], Ahmet DURSUN[2]

[1] Trakya University, Faculty of Science, Department of Biology, 22030, Edirne, TÜRKİYE
[2] Amasya University, Faculty of Science and Arts, Department of Biology, 05100, Amasya, TÜRKİYE

Cite this article as:

Fent M. & Dursun A. 2022. An up-to-date checklist of Turkish Pentatomidae (Hemiptera: Heteroptera) with additional records. *Trakya Univ J Nat Sci*, 23(Special Issue): S65-S111, DOI: 10.23902/trkjnat.1123152

Received: 01 June 2022, Accepted: 05 July 2022, Published: 20 July 2022

Edited by:
Kadri KIRAN

Corresponding Author:
Meral Fent
m_fent@hotmail.com

ORCID iDs of the authors:
MF. orcid.org/0000-0001-5787-6714
AD. orcid.org/0000-0002-5114-7470

Key words:
Shield bugs
Biodiversity
Türkiye
Taxonomy
Faunistic

Abstract: In this study, an up-to-date list of Pentatomidae family, one of the large families of Heteroptera suborder, in Türkiye with the latest taxonomic developments is presented. As a result of the literature review, 61 genera and 174 species/subspecies (2 species only in European Türkiye, 97 species only in Asian Türkiye) belonging to 4 subfamilies and 13 tribes from the Turkish Pentatomidae fauna were determined. Distribution of the species by subfamilies: 14 species of Asopinae (10 in European and 13 in Asian Türkiye), 125 species of Pentatominae (57 in European and 125 in Asian Türkiye), 1 species of Phyllocephalinae (only in Asian Türkiye) and 34 species of Podopinae (10 in European and 33 in Asian Türkiye). Of these species, 172 are native and 2 are introduced. The distributions of these species in Türkiye (in European and Asian Türkiye), Palaearctic distributions and changes in their taxonomic positions are given. In addition, additional records for 53 species, mainly from the Thrace Region, were given from various localities in Thrace and Anatolia. *Pentatoma rufipes* (Linnaeus, 1758) is first record for the Thrace Region. Four species, which were given in 19th century without a specific locality record, need to be verified. Two species, their names, are excluded from the Türkiye list.

Özet: Bu çalışmada, Heteroptera alt takımının büyük familyalarından biri olan Pentatomidae familyasının son taksonomik gelişmeler ile birlikte Türkiye'deki güncel bir listesi sunulmaktadır. Literatür taraması sonucunda Türkiye Pentatomidae faunasından 4 alt familya ve 13 tribusa ait 61 cins ve 174 tür/alttür (2 tür sadece Trakya Bölgesi'nde, 97 tür sadece Anadolu'da) tespit edilmiştir. Türün alt familyalara göre dağılımı şu şekildedir: Asopinae, 14 tür (Trakya'da 10, Anadolu'da 13), Pentatominae, 125 tür (Trakya'da 57, Anadolu'da 125), Phyllocephalinae 1 tür (sadece Anadolu'da) ve Podopinae 34 tür (Trakya'da 10, Anadolu'da 33). Bu türlerin Türkiye'deki (Trakya ve Anadolu'da) yayılışları, Palearktik yayılışları ve taksonomik konumlarındaki değişimler verilmiştir. Ayrıca Trakya ve Anadolu'nun çeşitli lokalitelerinden başta Trakya Bölgesi olmak üzere 53 tür için ek kayıtlar verilmiştir. *Pentatoma rufipes* (Linnaeus, 1758) Trakya Bölgesi için ilk kayıt olarak tespit edilmiştir. 19. yüzyılda belirli bir lokalite kaydı olmaksızın verilen dört türün doğrulanması gerekmektedir. İki tür ise gerekçeleriyle birlikte Türkiye listesinden çıkarılmıştır.

Introduction

Hetereoptera, also called true bugs, is a suborder of the order Hemiptera and is the largest group of hemimetabolous insects with the highest species diversity. Heteroptera are widespread in the Old World and New World continents and include terrestrial, semi-aquatic and aquatic species. More than 45,000 species are known worldwide, and over 9,365 species belonging to 1,632 genera are distributed in the Palaearctic Region (Aukema *et al.* 2013, Henry 2017). The Pentatomidae family is one of the largest families of Heteroptera, including terrestrial species with economic importance. Pentatomidae has 940 genera and 4,949 species belonging to 10 subfamilies worldwide, and 219 genera, 841 species and 19 subspecies belonging to four subfamilies in the Palaearctic Region (Rider 2006, Henry 2017, Rider *et al.* 2018). However, recently Roca-Cusachs *et al.* (2022) based on the mitochondrial and nuclear genes of 160 taxons from the Pentatomidae family, as a result of the molecular phylogenetic study, that the subfamily Cyrtocorinae is not related to Pentatomidae and its sister grup Serbinae, and that it is elevated to the family level as Crytocoridae and it was decided to accept Serbinae, which is represented by a single species belonging to a single genus, as the sister group of Pentatomidae and and not as a member of Phloeidae. In addition, it was concluded that

Pentatominae and Podopinae subfamilies and some their tribes are not monophyletic.

Species of the Pentatomidae family are quite diverse ecologically and morphologically. The species are generally medium-sized but very large and very small species are also known in the family. With exceptions, their antennae are 5-segmented, their tarsi are 3-segmented, and the scutellum is triangular and does not cover the abdomen, with the exception of Podopinae and some Asopinae subfamily species. The most unifying character is the sclerotized rod in the spermatheca of the female reproductive system. Except for only one New World pentatomid genus (*Trichopepla* Stål, 1867), all Pentatomidae species have this structure unlike other families (Rider 2006). Except Asopinae species, they have a phytophagous diet and some species (e.g. *Nezara viridula* (Linnaeus, 1758), *Aelia* spp., *Eurydema* spp., *Halyomorpha halys* (Stål, 1855) etc.) are known as agricultural pests. Asopinae species are predators and feed on various invertebrates and eggs, larvae and adults of other insects (Rider 2006).

The first studies on the Pentatomidae family in Türkiye were initiated by foreign researchers in the first half of the 19th century (Lefebvre 1831) and have continued until today. Géza Horváth is one of the first researchers to carry out extensive studies in the country. Horváth (1883, 1889, 1891, 1896, 1901, 1903ab, 1905, 1917, 1918, 1919) recorded many species from many localities of Anatolia, especially Southern and Southeastern Anatolia, and described several new species. Reuter (1890) and Gadeu de Kerville (1939) studied mainly the region around İzmir, Puton (1892) conducted his studies in Southeastern Anatolia and gave a wide list of species belonging to the region, and Puton and Noualhier (1895) made additions to this list. Escherich (1897) gave records in Ankara and its vicinity, Kiritshenko (1918, 1924) in the Northeastearn parts and the Eastern Anatolia Region of Türkiye. Fahringer (1922) conducted studies in various parts of the country, but mainly in the western and southern parts. The first comprehensive paper was provided by Hoberlandt (1956), who provided also review of previous records and documented presence of 116 Pentatomidae species in Türkiye. Later, Seidenstücker (1957, 1958, 1960, 1964, 1975), Wagner (1959, 1966), Linnavuori (1965), Kment & Jindra (2006, 2008), Şerban (2010), and Matocq *et al.* (2014) gave records from various places in Thrace and Anatolia regions. In the following years, Awel (1977) conducted studies on *Aelia* spp. in Türkiye and Awad (2000) on the tribe Carpocorini.

The local researchers have also made valuable contributions to the faunal studies on Turkish Pentatomidae. Among the studies, the most comprehensive ones are Lodos *et al.* (1978, 1998) in the Aegean Marmara, Western Black Sea, Central Anatolia and Mediterranean Regions, Önder *et al.* (1995) in the Southeastern Anatolia Region, Kıyak (1990, 1993, 2000, 2016) in Ankara, Elazığ, Kahramanmaraş provinces, Fent & Aktaç (1999, 2007b, 2008) in the Thrace Region, Dursun & Kartal (2008a,b,c), in the Central Black Sea Region, and Fent (2010) in the West Black Sea Region. Lodos & Önder (1982, 1983) discussed the subfamily Asopinae and the tribe Sciociocorini. Except from these, numerous studies have contributed to the Pentatomidae fauna of Türkiye from various localities in Thrace and Anatolia regions (Önder *et al.* 1981, 1983, 1984, Özsaraç *et al.* 2001, Külekçi *et al.* 2009, Yazıcı *et al.* 2014, Tezcan *et al.* 2010, 2013, Dursun & Fent 2011, Fent 2011, Çerçi *et al.* 2018, Çerçi & Gözüaçık 2019, Çerçi & Özgen (2021). Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Özgen *et al.* 2005a, b, Bolu *et al.* 2006, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Tezcan *et al.* 2010, 2013, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Fent & Japoshvili 2012, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021, Çerçi & Özgen 2021).

Türkiye is a large country with an area of 783.562km^2 (except islands and lakes) consisting of two peninsulas (Anatolia and Thrace) located on the continents of Asia and Europe. 755.688 km^2 of the total surface area of the country constitutes the territory in Asia (Anatolia), while the remaining 23.764 km^2 forms the territory in Europe (Turkish Thrace). The country is located between 36° and 42° north parallels and 26° and 45° east meridians. It is bordered by Bulgaria in the northwest, Greece in the west, Georgia in the northeast, Armenia, Iran and Azerbaijan in the east, and Iraq and Syria in the southeast. It is surrounded by the island of Cyprus and the Mediterranean Sea in the south, the Aegean Sea in the west and the Black Sea in the north. The Sea of Marmara, along with the Bosphorus and the Dardanelles, separates Anatolia from Thrace. The country consists of 7 geographical regions as Marmara Region (including Thrace Region), Aegean Region, Mediterranean Region, Central Anatolia Region, Black Sea Region, Eastern Anatolia Region and Southeastern Anatolia Region and 81 provinces [3 of them in Thrace Region, 76 of them in Anatolia and two provinces (İstanbul and Çanakkale) located in both] (Fig. 1).

There are three different climate types in Türkiye. In the Mediterranean climate, seen on the Aegean Sea and Mediterranean coasts, summers are hot and dry, and winters are warm and rainy. The dominant vegetation of this climate type is maquis. In the Black Sea climate, which is a temperate oceanic climate type seen on the Black Sea coasts, precipitation is seen in every season, and the natural vegetation is forest. The Black Sea coast is the only region of Türkiye that receives high precipitation throughout the year, and the Eastern Black Sea region receives 2000–2500 millimeters of precipitation annually. A transitional climate is observed on the shores of the Marmara Sea, which connects the Aegean Sea and the Black Sea, Mediterranean climate in the south, Black Sea climate in the north and continental climate in the northwest of the Marmara Sea.

Fig. 1. Map of Türkiye with the provinces (Fent *et al.* 2011).

In the country, the mountains extending parallel to the coast in the Black Sea and the Mediterranean regions prevent the temperate air masses from the seas from reaching the interior. The continental climate is seen in the inner parts of the country in the Central Anatolia Region, Eastern Anatolia and Southeastern Anatolia regions. In this climate type, annual and diurnal temperature differences are high, summers are hot and dry, winters are cold and snowy. In the eastern regions, winters are quite harsh. In Eastern Anatolia, temperatures can drop as low as -30°C and -40°C, and snow remains on the ground at least 120 days a year. In the west, winter temperatures are observed as 1°C on average. Generally, July and August are the driest months in the country, while May is the month with the most precipitation (Anonymus, 2022).

Surrounded by Bulgaria in the north, Greece and the Aegean Sea in the west, the Marmara Sea in the south and the Black Sea in the east, the Thrace Region is the southeast extension of the Balkan Peninsula and constitutes 3% of Türkiye. There are moist forests in the Istranca Mountains in the north of the region, and dry forests in the Koru Mountains and Ganos Mountains in the south. In the central part, there is an anthropogenic steppe (the Ergene Basin) which is characterized by large agricultural areas. Mediterranean vegetation dominated by maquis is located in the coastal and central parts. Thrace Region is almost flat in terms of elevation above sea level. Its highest point is the Mahya Hill in the Istranca Mountains with a height of 1035 m. The Meriç River defines the Greek border, the Ergene River divides into many branches and passes through the Ergene Basin, and a series of lakes and streams of various sizes represent the wetlands of the region (Dönmez, 1968).

Anatolia is a peninsula surrounded by the Black Sea in the north, Georgia in the northeast, Armenia, Azerbaijan and Iran in the east, Iraq, Syria and the Mediterranean in the south, the Aegean Sea in the west and the Marmara Sea in the northwest. A large part of Anatolia (80%) has a hilly structure. Numerous mountain ranges not only create barriers to the passage of organisms, but also separate areas with different climatic conditions. The North Anatolian Mountains or the Black Sea Mountains are mountain ranges that surround the north of Anatolia along the Black Sea, parallel to the coast, in several rows. These fold mountains, formed as a result of orogeny, separate the temperate rainy Black Sea coast from the dry steppes of Central Anatolia and the cold-arid Eastern Anatolia. The coastline bordered by mountains also allows the passage of Boreal Caucasian species. In the south, the eastern part of the Taurus mountain range separates the dry hot steppe and desert Southeastern Anatolia from the cold-arid Eastern Anatolia, the western part separates the Mediterranean coastal region, which has a typical Mediterranean climate, from the arid steppe form Central Anatolia. There are also several volcanic mountains in Central and Eastern Anatolia (Demirsoy 2002, Fent *et al.* 2011, Dursun & Fent 2017).

With all this diversity of landforms, biological diversity, climate and ecological differences that occur in short distances, Anatolia can be compared to a small continent. From the point of view of plant diversity, the number of known plant species in Anatolia is 9.200, but in Europe, which is 13 times larger, 11,500 species are currently known, and the faunistic richness in Anatolia is much more pronounced than floral richness. This extraordinary biological richness of Türkiye is related to its geographical location and various barriers, passages and climate types created by geological formations. The country acts as a bridge between the continents of Asia and Europe in east-west as well as north-south direction, and the passage of boreal elements from the Caucasus,

eremial elements from Iran and Central Asia, desert and African elements and Mediterranean elements from Africa and the Arabian Peninsula, the European faunal elements through the Thrace Region. Extremely diverse geological formations create various climate types and macro- and microhabitats, which in turn increases biodiversity. The same geological formations support the formation of endemic species by forming barriers in the south and north of Anatolia. Another reason for the species diversity is that during the Quaternar glaciation, important refugee areas in Anatolia and Thrace regions were not affected by the glaciation and formed a shelter for organisms (Dönmez 1968, Demirsoy 2002, Fent *et al.* 2011, Dursun & Fent 2017).

Materials and Methods

In this study, the studies on the Pentatomidae family from the end of the 19th century to the present were reviewed and the last updated list of the Turkish Pentatomidae fauna was created by taking into account the taxonomic arrangements. In addition, additional locality records of 53 species identified as a result of the evaluation of Pentatomidae prefixes collected from various localities in the Thrace Region and Anatolia between the years 1991–2021 are presented. Türkiye distributions of the species are given separately for the Thrace Region (European Türkiye) and Anatolia (Asian Türkiye), and the Palaearctic distributions are given from Aukema (2020). A list of Pentatomidae of Türkiye is presented in Table 1, and a map showing the provinces in Türkiye are presented (Fig. 1).

Explanations of regional abbreviations for China and Russia

CH, China
CE CH, Central Territory
NE CH, Northeastern Territory
NO CH, Northern Territory
NW CH, Northwestern Territory
SE CH, Southeastern Territory (Macao and Hong Kong incl.)
SW CH, Southwestern Territory
WP CH, Western Plateau
RU Russia
CT RU, Central European Territory
ES RU, East Siberia
FE RU, Far East
NT RU, North European Territory
ST RU, South European Territory
WS RU, West Siberia

Ordo HEMIPTERA
Subordo Heteroptera
Infraordo Pentatomomorpha
Superfamily Pentatomoidea
Family Pentatomidae Leach
Subfamily Asopinae Amyot & Serville
Genus *Andrallus* Bergroth

Andrallus spinidens (Fabricius, 1787)

Asian Türkiye: Adana, Aydın, İzmir (Horváth 1901, Hoberlandt 1956, Lodos & Önder 1983, Önder *et al.* 1983, 2006).

General Distribution: Europe: Italy Greece. North Africa: Egypt. Asia: Asian Türkiye, Azerbaijan, China (CE SE SW WP) Iran, Iraq, Japan, Sinai, Tadzhikistan, Turkmenistan. Extralimital: Australia, tropical Africa and Asia, southern United States, Central and South America.

Genus *Arma* Hahn
Arma custos (Fabricius, 1794)
= *A. neocustos* Ahmad & Önder, 1990
= *A. neoinsperata* Ahmad & Önder, 1990

Material examined. Kırklareli: Center-Çağlayık (620 m): 25.08.1998, ♂; Demirköy- Sislioba (400 m): 25.07.2001, ♂.

European Türkiye. Edirne, Kırklareli (Lodos & Önder 1983, Ahmad & Önder 1990a as *A. neocustos* and *A. neoinsperata*, Fent & Aktaç 1999).

Asian Türkiye. Ankara, Bolu, Bursa, Kocaeli, Manisa, Ordu (Horváth 1883, Hoberlandt 1956, Lodos & Önder 1983), Ankara (Ahmad & Önder 1990a as *A. neocustos*) Kocaeli, Ordu (Ahmad & Önder 1990a, as *A. neoinsperata*).

General Distribution. Europe: Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, European Türkiye, France, Germany, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (CE NE NO NW SE SW WP), Georgia, Iran, Japan, Kirgizia, Korea, Mongolia, Russia (ES FE WS).

Note: *Arma neocustos* Ahmad & Önder 1990 and *Arma neoinsperata* Ahmad & Önder 1990 given from Kırklareli (Lüleburgaz) are synonimizied with *A. custos* by Thomas (1994).

Arma insperata Horváth, 1899

Asian Türkiye: Ankara, Bilecik, Bolu, İzmir, Kayseri, Zonguldak (Seidenstücker 1975, Lodos & Önder 1983, Ahmad & Önder 1990a, Kıyak 1993, Önder *et al.* 2006).

General Distribution: Europe: Bulgaria, Greece, Hungary, Macedonia, Romania, Serbia, Slovakia. Asia: Asian Türkiye, Iran.

Note: *Arma insperata* was mistakenly given from European Türkiye by Rider (2006) and Aukema (2020) based on Ahmad & Önder (1990a). However, there is no record of European Türkiye by Ahmad & Önder (1990a).

Genus *Jalla* Hahn
Jalla dumosa (Linnaeus, 1758)

European Türkiye: Kırklareli (Fent & Aktaç 2007b).

Asian Türkiye: Ankara, Bursa, Diyarbakır, Isparta, Kayseri, Kırıkkale, Konya, Manisa (Horváth 1883, Escherich 1897, Hoberlandt 1956, Lodos & Önder 1983, Kıyak 1993, Lodos *et al*. 1998, Önder *et al.* 2006, Matocq *et al.* 2014, Yazıcı *et al.* 2014).

General Distribution: Europe: Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NE NO NW), Georgia, Iran, Israel, Kirgizia, Russia (ES FE WS), Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Genus *Perillus* Ståll

Perillus bioculatus (Fabricius, 1775)

European Türkiye: Edirne, Kırklareli, Tekirdağ (Kıvan 2004, Fent & Aktaç 2007a).

Asian Türkiye: Amasya, Ankara, Bolu, Çorum, Kastamonu, Zonguldak (Dursun & Fent 2018, Kıyak *et al.* 2019, Çerçi *et al*. 2021, Dursun, 2021).

General Distribution: Europe (introduced): Bulgaria, Greece, European Türkiye, Serbia. North Africa (introduced): Algeria. Asia: Asian Türkiye. Extralimital: North America and Mexico.

Note: Introduced species in Turkish fauna.

Genus *Picromerus* Amyot & Serville

Picromerus bidens (Linnaeus, 1758)

European Türkiye: Kırklareli, Tekirdağ (Lodos *et al.* 1978, Lodos & Önder 1983, Önder *et al*. 2006, Orçan & Kıvan 2017).

Asian Türkiye: Ankara, Artvin, Çanakkale, Çorum, Giresun, Isparta, Nevşehir, Ordu (Lodos & Önder 1983, Kıyak 1993, Lodos *et al.* 1998, Önder *et al.* 2006, Fent & Japoshvili 2012).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia, Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Great Britain, Germany, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (CE NE NO NW), Georgia, Iran, Kirgizia, Korea, Mongolia, Russia (ES FE WS), Tadzhikistan, Uzbekistan. Extralimital: Canada, USA.

Picromerus brachypterus Ahmad & Önder, 1990

European Türkiye: Edirne (Fent & Aktaç 2007b).

Asian Türkiye: Bolu, İzmir, Rize (Ahmad & Önder 1990b, Önder *et al.* 2006, Külekçi *et al.* 2009).

General Distribution: Europe: European Türkiye. Asia: Asian Türkiye.

Note: This species is endemic to Türkiye, however, its validity requires confirmation.

Picromerus conformis (Herrich-Schaeffer, 1841)

Material examined: İstanbul: Çatalca-Ormanlı (75 m): ♀.

European Türkiye: Edirne, Tekirdağ (Lodos *et al.* 1978, Lodos & Önder 1983, Önder *et al.* 2006).

Asian Türkiye: Ankara, Bursa, Çorum, Diyarbakır, İzmir, Manisa (Horváth 1883, Lodos & Önder 1983, Lodos *et al.* 1998, Önder *et al*. 2006).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Croatia, European Türkiye, Finland, Greece, Hungary, Italy, Macedonia, Moldavia, Romania, Serbia, Slovakia, Slovenia, Switzerland, Ukraine. North Africa: Algeria. Asia: Azerbaijan, Asian Türkiye, Georgia, Iran.

Picromerus pseudobidens Ahmad & Önder, 1990

Material examined: Tekirdağ: Malkara-Mahramlı (Cumhuriyet Ormanı) (230 m): 07.08.2001, ♀.

European Türkiye: Kırklareli, Tekirdağ (Ahmad & Önder 1990b, Önder *et al.* 2006).

Asian Türkiye: Ankara, Nevşehir, Rize, Sivas (Ahmad & Önder 1990b, Önder *et al.* 2006).

General Distribution: Europe: European Türkiye. Asia: Asian Türkiye.

Note: This species is endemic to Türkiye, however, its validity requires confirmation.

Genus *Pinthaeus* Ståll

Pinthaeus sanguinipes (Fabricius, 1781)

Asian Türkiye: Bolu, Bursa, Ordu (Horváth 1883, Reuter 1890, Hoberlandt 1956, Lodos & Önder 1983).

General Distribution: Europe: Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Moldavia, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. Asia: Asian Türkiye, Azerbaijan, China (NE NO), Georgia, Iran, Israel, Japan, Korea, Russia (FE WS), Syria.

Genus *Rhacognathus* Fieber

Rhacognathus punctatus (Linnaeus, 1758)

Material examined: Edirne: Center-Suakacağı (150 m): 30.06.2001, ♂.

European Türkiye: Edirne (Lodos *et al.* 1978**)**

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia,

Czech Republic, Denmark, Estonia, European Türkiye, Finland, France, Great Britain, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: China (NO), Georgia, Japan, Kazakhstan, Kirgizia, Mongolia, Russia (ES FE WS).

Note: Rider (2006) and Aukema (2020) mentions Asian Türkiye in the distribution of *Rhacognathus punctatus*, but during the literature review, there was no data on the distribution of this species in Anatolia. The record given in this study is the second record of the species in Türkiye.

Genus *Troilus* Stål
Troilus luridus (Fabricius, 1775)

European Türkiye: Thrace (Önder *et al.* 2006).

Asian Türkiye: Afyonkarahisar (Akıncı & Avcı 2016).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: Armenia, Asian Türkiye, Azerbaijan, China (NO SW WP), Iran, Georgia, Korea, Russia (ES FE WS). Extralimital: Burma, India.

Genus *Zicrona* Amyot & Serville
Zicrona caerulea (Linnaeus, 1758)

Material examined: Kırklareli: Center-Kuzucu (300 m): 25.08.1998, ♀; Demirköy-Yiğitbaşı (400 m): 06.07.1997, ♀, ♂; Pınarhisar-Yenice (450 m): 06.07.1997, ♂; Tekirdağ: Center-Uçmakdere (300 m): 06.08.1998, ♀.

European Türkiye: Edirne, Kırklareli, Tekirdağ **(**Lodos *et al.* 1978, Fent & Aktaç 1999, 2008, Önder *et al.* 2006, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adıyaman, Ağrı, Ankara, Artvin, Balıkesir, Bartın, Bolu, Çankırı, Diyarbakır, Erzurum, Gaziantep, Hakkari, Hatay, Iğdır, İçel, İzmir, Kars, Kastamonu, Kilis, Konya, Mersin, Muğla, Rize, Samsun, Siirt, Tokat, Zonguldak **(**Puton & Noualhier 1895, Escherich 1897, Kiritshenko 1918, Hoberlandt 1956, Lodos & Önder 1983, Lodos *et al.* 1998, Önder *et al.* 1995, 2006, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Gözüaçık *et al*. 2011, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Egypt, Morocco. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (CE NE NO NW SE SW), Cyprus, Georgia, Iran, Iraq, Israel, Japan, Jordan, Kirgizia, Korea, Mongolia, Russia (ES FE WS), Syria, Taiwan, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: America, Oriental Region.

Subfamily PENTATOMINAE Leach
Tribe AELIINI Douglas & Scott
Genus *Aelia* Fabricius
Aelia acuminata (Linnaeus, 1758)

Material examined: Çanakkale: Eceabat-Küçükanafarta (20 m): 08.06.2001, ♂; between Kabatepe-Alçıtepe (50 m): 08.06.2001, 2♀♀; Behramlı (100 m): 08.06.2001, ♀; Alçıtepe (50 m): 12.08.2001, 2♀♀, ♂; Kemalyeri (60 m): 12.08.2001, ♂; Gelibolu-Süleymaniye (50 m): 30.07.1998, ♀, ♂; Güneyli (50 m): 31.05.1999, 2 ♀♀, ♂; Cumalı (40 m): 07.06.2001, ♀; Kocaçeşme (Korudağı) (350 m): 10.08.2001, ♀, ♂; Ilgardere (20 m): 11.08.2001, ♂; Edirne: Center-Uzunbayır (200 m): 05.07.1997, 4 ♀♀, 2 ♂♂; Suakacağı (150 m): 05.07.1997, 2 ♂♂, 01.09.2001, ♂; Havsa-Köseömer (80 m): 30.08.1992, 4♀♀, ♂; Hasköy (95 m): 11.05.2002, ♀; Lalapaşa- Hacıdanişment (500 m): 05.07.1997, 2 ♂♂; 01.09.2001, ♂; Doğanköy (350 m): 05.07.1997, 2 ♂♂; 01.09.2001, ♀; Kalkansöğüt (400 m): 05.07.1997, ♀; Sinanköy (300 m): 02.08.2000, ♂; Ömeroba (310 m): 02.08.2000, ♀, ♂; Keşan-Korudağı (300 m): 07.06.2001, ♂; İstanbul: Gaziosmanpaşa Boğazköy (60 m): 15.06.2001, ♀; Bahçeköy-Bilezikçi Çiftliği (25 m): 24.06.1993, 7 ♀♀, ♂; Çatalca-Danamandıra (150 m): 15.08.1998, 3♀♀; Aydınlar (125 m): 28.08.1998, 2 ♀♀; Kabakça (100 m): 28.08.1998, ♀; Ormanlı (75 m): 29.08.1998, ♀, ♂; Silivri (50 m): 25.08.1992, ♂; Küçüksinekli (170m): 25.08.1992, 2 ♀♀, 2 ♂♂; Beyciler (140 m): 15.08.1997, ♀, ♂; Çantaköy (50m): 28.08.1998, ♀, ♂; Büyükkılıçlı (150 m): 15.06.2001, ♀, ♂; Kırklareli: Center-Ürünlü (60 m): 21.08.1992, ♀; Çukurpınar (500 m): 25.08.1998, ♂; Çağlayık (620 m): 25.08.1998, ♂; 17.07.2001, 2 ♂♂; Kuzucu (300 m): 25.08.1998, ♀, ♂; Dereköy (300 m): 17.07.2001, 2 ♂♂; Demirköy-Yiğitbaşı (400 m): 06.07.1997, ♀; Sivriler (350 m): 27.08.1998, 2 ♀♀, ♂; Sarpdere (300 m): 26.05.2002, ♀; Iğneada (0 m): 25.08.2001, 3 ♂♂; between Yeşilce-Avcılar (350 m): 25.07.2001, 2♀♀; Kofçaz (500 m): 02.08.2000, ♂; Erikler (430 m): 02.08.2000, ♀; between İnece-Paşayeri (95 m): 02.08.2000, 2 ♂♂; Ahmetler (570 m): 17.07.2001, 2♂♂; Beyci (350 m): 17.07.2001, ♂; Lüleburgaz-Büyükkarıştıran (75 m): 10.08.1997, 2 ♀♀; Ceylanköy (70 m): 26.08.1998, ♀, ♂; Ertuğrul (230 m): 28.08.2002, ♀; Pınarhisar- Yenice (450 m) 06.07.1997, ♂; Mahya Hill (700 m): 07.06.2003, 2 ♀♀; Vize (200 m): 27.08.1998, 2 ♂♂; Kıyıköy (0 m): 26.08.1998, ♀, ♂; between Kıyıköy-Kömürköy (200 m.): 16.06.2001, ♀, ♂; Tekirdağ: Center- Kaşıkçı (190 m): 26.08.1992, ♀, ♂; Köseilyas (50 m): 02.08.1998, ♀; Uçmakdere (300 m); 06.08.1998, ♀, ♂; Oruçbeyli (200 m): 07.08.2001, 2 ♀♀;

18.05.2003, ♀; Işıklar (Ganos Mountains) (200 m): 18.05 2003, ♀; Çerkezköy-Veliköy (130 m): 11.08.1997, 2 ♀♀, ♂; Hayrabolu-Dambaslar (110 m): 16.08.1997, ♀; Malkara-Demircili (200 m): 24.08.1992, ♀; Hasköy (250 m): 26.09.1992, ♀; Izgar Village (200 m): 05.05.2001, ♂; Şahin (200 m): 29.07.1998, ♀, ♂; between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♂; Sağlamtaş (170 m): 08.08.2001 3 ♂♂; Karacahalil (210 m): 14.09.2001, 2 ♂♂; Yenidibek (210 m): 14.09.2001, 3 ♀♀, ♂; Danişment (Korudağı) (250 m): 15.09.2001 2 ♂♂; Muratlı (50 m): 09.06.2001, ♀; Hanoğlu (60 m): 09.06.2001, ♂; between Pınarca-Safaalan (100 m): 18.09.2001, ♂; Saray (180 m): 16.06.2001, 2♀♀; Sinanlı (105 m): 11.09.1997, 2 ♀♀, 2 ♂♂; Büyükyoncalı (200 m): 26.08.1998 ♂; Şarköy- between Emirali-Çınarlıdere (210 m): 31.05.1999, ♀; Ormanlı (75 m): 08.08.2001, 2 ♂♂; Ulaman (100 m): 09.08.2001, ♀; Yayaköy (230 m): 09.08.2001, 2 ♂♂; Yeniköy (200 m): 10.08.2001, ♀, ♂.

European Türkiye: Çanakkale, Edirne, Tekirdağ, Kırklareli, İstanbul (Fahringer 1922, Hoberlandt 1956, Awel 1977, Lodos *et al.* 1978, Fent & Aktaç 1999, Şerban 2010, Fent 2011, Yazıcı *et al.* 2014, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bartın, Bayburt, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Düzce, Erzincan, Erzurum, Gaziantep, Giresun, Gümüşhane, Hatay, Iğdır, İçel, İzmir, Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Kırşehir, Kocaeli Konya, Manisa, Mardin, Mersin, Muğla, Nevşehir, Niğde, Osmaniye, Rize, Sakarya, Samsun, Siirt, Sinop, Sivas, Şanlıurfa, Şırnak, Tokat, Trabzon, Tunceli, Uşak, Zonguldak (Puton 1892, Horváth 1901, Fahringer 1922, Hoberlandt 1956 as *A. turanica*, Linnavuori 1965, Awel 1977, Lodos *et al.* 1978, 1998, Önder *et al.* 1995, Fent & Aktaç 1999, Kıyak 2000, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Özgen *et al.* 2005b, Dursun & Kartal 2008a, Külekçi *et al.* 2009: Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, Yugoslavia. North Africa: Algeria, Egypt, Morocco, Madeira, Tunisia. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW SW), Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kirgizia, Lebanon, Russia (ES WS), Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Pakistan.

Aelia albovittata Fieber, 1868

European Türkiye: Çanakkale, Edirne (Fent & Aktaç 2007b, Fent 2011).

Asian Türkiye: Adana, Adıyaman, Amasya, Ankara, Balıkesir, Bursa, Çanakkale, Diyarbakır, Elazığ, Gaziantep, Hatay, İçel, İzmir, Kahramanmaraş, Karaman, Kırıkkale, Konya, Manisa, Sivas, Şanlıurfa, Tokat (Fieber, 1868, Horváth 1883, 1901, Puton 1892, Escherich 1897, Reuter 1913, Linnavuori 1954, Hoberlandt 1956, Awel 1977, Lodos *et al.* 1978, 1998, Kıyak 1990, 2016, Önder *et al.* 1995, Derjanschi & Péricart 2005, Dursun & Kartal 2008a, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Özgen & Dioli 2018).

General Distribution: Europe: European Türkiye, Greece. Asia: Asian Türkiye, Iran, Iraq, Syria.

Aelia alticola Kiritshenko, 1914

European Türkiye: Edirne, Tekirdağ (Awel 1977 as *A. satunini*).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Bursa, Çorum, Elazığ, Erzincan, Gaziantep, Iğdır, Isparta, Karaman, Kars, Konya, Manisa, Niğde, Ordu, Samsun, Sinop, Sivas, Tokat (Kiritshenko 1918, 1930 as *A. satunini*, Hoberlandt 1956 as *A. satunini*, Seidenstücker 1960 as *A. satunini*, Awel 1977 as *A. satunini*, Lodos *et al.* 1978, 1998 as *A. satunini*, Önder *et al.* 2006 as *A. satunini*, Dursun & Fent 2011a, Matocq *et al.* 2014).

General Distribution: Europe: European Türkiye. Asia: Armenia, Asian Türkiye, Azerbaijan, Iran, Iraq, Tadzhikistan, Turkmenistan, Uzbekistan.

Aelia furcula Fieber, 1868

Asian Türkiye: Adana, Adıyaman, Ankara, Bartın, Erzincan, Erzurum, Gaziantep, Iğdır, Isparta, Kars, Kayseri, Konya, Manisa, Mersin, Niğde, Samsun, Sivas, Tunceli (Horváth 1905, Kiritshenko 1918, Hoberlandt 1956, Seidenstücker 1960, Derjanschi & Péricart 2005, Önder *et al.* 2006, Yazıcı *et al.* 2014, Bulak & Yıldırım 2021).

General Distribution: Europe: Greece, European Kazakhstan, Russia (CT: Samara Prov. ST), Ukraine. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Iran, Kirgizia, Tadzhikistan, Turkmenistan, Uzbekistan.

Aelia germari Küster, 1852

Asian Türkiye: Elazığ, Gaziantep, Hatay (Puton 1892, Hoberlandt 1956, Önder *et al.* 1995, 2006, Özgen & Dioli 2018).

General Distribution: Europe: Croatia, France, Italy, Macedonia, Montenegro, Portugal, Spain. North Africa: Algeria, Morocco, Tunisia. Asia: Asian Türkiye, Israel.

Aelia klugii Hahn, 1833

Asian Türkiye: Kars (Kiritshenko 1918, Önder *et al.* 2006).

General Distribution: Europe: Albania, Austria, Belgium, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Macedonia, Moldavia, Montenegro, Netherlands, Poland, Romania, Russia (CT NT ST), Serbia, Slovakia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria. Asia: Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO SW), Georgia, Iraq, Kirgizia, Korea, Mongolia, Russia (ES FE WS), Tadzhikistan.

Aelia melanota Fieber, 1868

Asian Türkiye: Ankara, Batman, Bingöl, Diyarbakır, Elazığ, Iğdır, Şanlıurfa, Tunceli (Wagner 1959 as *A. obtusa*, Önder *et al.* 2006, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Russia (ST: Caucasus). Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Georgia, Iran, Kirgizia, Tadzhikistan, Turkmenistan, Uzbekistan.

Aelia notata Rey, 1887

Asian Türkiye: Antalya, Gaziantep, Hatay, Kahramanmaraş (Puton & Noualhier 1895, Hoberlandt 1956, Derjanschi & Péricart 2005, Önder *et al.* 1995, 2006, Kıyak 2016).

All records related to this species are given as *A. cognata.*

General Distribution: Europe: France, Russia (ST: Caucasus), Spain, Ukraine. North Africa: Morocco. Asia: Asian Türkiye.

Aelia rostrata Boheman, 1852

Material examined: Çanakkale: Eceabat- between Alçıtepe-Kabatepe (50 m): 12.08.2001 ♂; Edirne: Center-Karaağaç (41 m): 21.05.2003, ♀, ♂; Keşan-Korudağı (300 m): 07.06.2001, 2 ♂♂; Lalapaşa-Sinanköy (300 m): 02.08.2000, ♂; Ömeroba (310 m): 02.08.2000, ♀; İstanbul: Çatalca-Danamandıra (150 m): 15.08.1992, ♀; Silivri-Küçüksinekli (170 m): 25.08.1992, 3 ♀♀, 2 ♂♂; Çantaköy (50 m): 28.08.1998, ♀; Kırklareli: Center-Ürünlü (60 m): 21.08.1992, 2♀♀; Çağlayık (620 m): 17.07.2001, 2♀♀, ♂; Dereköy (300 m): 17.07.2001, ♂; Babaeski-Taşköprü (200 m): 11.05.2001, ♀, ♂; Demirköy-Yiğitbaşı (400 m): 06.07.1997, ♀; İğneada (0 m): 25.08.2001, ♂; Balaban (700 m): 29.08.2002, ♀, ♂; Balaban (Velika Deresi) (500 m): 26.05.2002, ♀ ♂; Kofçaz (500 m): 02.08.2000, ♀; Erikler (430 m): 02.08.2000, ♀; Ahmetler (570 m): 17.07.2001, ♀, ♂; Beyci (350 m): 17.07.2001, ♀; Lüleburgaz-Ertuğrul (230 m): 28.08.2002, ♀; Pınarhisar- Poyralı (310 m): 27.06.2002, ♀; Mahya Hill (880 m): ♀; Mahya Hill (800 m): 07.06.2003, 2 ♂♂; Mahya Hill (700 m): 07.06.2003, ♂; Vize (200 m): 27.08.1998, ♀; Tekirdağ: Center Kaşıkçı (190 m): 26.08.1992, ♂; Işıklar (Ganos Mountains) (200 m): 18.05 2003, ♀; Malkara- Hasköy (250 m): 26.09.1992, ♂; between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♂; Izgar Village (200 m): 05.05.2001 ♀; Danişment (Korudağı) (250 m): 15.09.2001, ♀; Muratlı-Hanoğlu (60 m): 09.06.2001, ♂; between Pınarca-Safaalan (100 m): 18.09.2001, ♀, ♂; Saray (180 m): 16.06.2001, ♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Hoberlandt 1956, Awel 1977, Lodos *et al.* 1978, Kıvan 1998, Fent & Aktaç 1999, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Yazıcı *et al.* 2014).

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Aksaray, Amasya, Ankara, Antalya, Artvin, Balıkesir, Bartın, Bayburt, Bilecik, Bolu, Burdur, Çankırı, Çorum, Diyarbakır, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Iğdır, Isparta, İstanbul, İzmir, Hatay, Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Kayseri, Kırıkkale, Kırşehir, Kocaeli, Konya, Kütahya, Manisa, Mardin, Mersin, Muğla, Muş, Nevşehir, Niğde, Sakarya, Samsun, Siirt, Sivas, Şanlıurfa, Şırnak, Tokat, Tunceli, Uşak, Yozgat, Zonguldak (Puton & Noaulhier 1895, Escherich 1897, Horváth 1903a as *A. syriaca*, Kiritshenko 1918, Fahringer 1922, Hoberlandt 1956, Wagner 1959, Awel 1977, Lodos *et al.* 1978, 1998, Önder *et al.* 1995 as *A. syriaca*, Kıyak 2000, Özgen *et al.* 2005b, Dursun & Kartal 2008a, Külekçi *et al.* 2009, Fent 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Fent & Japoshvili 2012, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019, Çerçi & Özgen 2021)

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, European Türkiye, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Macedonia, Moldavia, Montenegro, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Ukraine. North Africa: Algeria, Libya, Morocco, Tunisia. Asia: Armenia, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Kazakhstan, Syria.

Aelia sibirica Reuter, 1884

Asian Türkiye: Sivas (Derjanschi & Péricart 2005).

General Distribution: Europe: Bulgaria, European Kazakhstan, Italy, Russia (CT: Samara Prov. ST), Ukraine. Asia: Asian Kazakhstan, Asian Türkiye, China (NO NW WP), Iran, Kirgizia, Mongolia, Russia (ES WS).

Aelia virgata (Herrich-Schaeffer, 1841)

Material examined: Edirne: Keşan-Erikli (0 m): 24.06.1995, ♂; Tekirdağ: Muratlı-Arzulu (50 m): 09.06.2001, ♂.

European Türkiye: Edirne, Kırklareli, Çanakkale (Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999).

Asian Türkiye: Afyonkarahisar, Amasya, Ankara, Bilecik, Diyarbakır, Elazığ, Erzurum, Gaziantep, Hatay, Iğdır, İzmir, Kahramanmaraş, Konya, Malatya, Tokat, Tunceli, Uşak (Reuter 1890, Escherich 1897, Hoberlandt 1956, Wagner 1959, Seidenstücker 1960, Awel 1977, Lodos *et al.* 1978, 1998, Önder *et al.* 1995, Derjanschi & Péricart 2005, Kıyak 2000, 2016, Özsaraç *et al.* 2001, Dursun & Kartal 2008a, Dursun & Fent 2011a, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019, Özgen *et al.* 2021).

General Distribution: Europe: Bulgaria, European Türkiye, Greece, Macedonia, Ukraine. Asia: Armenia, Asian Türkiye, Azerbaijan, Iran, Israel, Lebanon, Syria.

Genus *Neottiglossa* W. Kirby
Neottiglossa bifida (A. Costa, 1847)

Material examined: İstanbul: Çatalca-Binkılıç (125 m): 03.10.1992, ♂; 18.09.2001, ♂; Kabakça (100 m): 28.08.1998, ♀, 2 ♂♂; Ömerli (80 m): 15.06.2001, ♀; Kırklareli: Center-Çukurpınar (500 m): 25.08.1998, ♀; Tekirdağ: Center-Oruçbeyli (200 m): 07.08.2001, ♂; Hayrabolu-Karabürçek (60 m): 23.05.2002, ♀, ♂; Malkara-Izgar Village (200 m): 26.09.1992, 3 ♂♂; 28.07. 1998, 10 ♀♀, 4 ♂♂; between Karaiğdemir-Evrenbey (100 m): 29.07.1998, 4 ♀♀, 3 ♂♂; Muratlı-Hanoğlu (60 m): 09.06.2001, 2 ♂♂.

European Türkiye: Çanakkale, Edirne, İstanbul (Horváth 1918, Hoberlandt 1956, Fent & Aktaç 1999, Fent 2011, Yazıcı *et al.* 2014).

Asian Türkiye: Amasya, Ankara, Balıkesir, Bayburt, Bursa, Erzincan, Erzurum, Gaziantep, Hatay, İstanbul, İzmir, Kars, Mersin, Muğla, Sakarya, Samsun, Sivas, Tokat, Tunceli (Horváth 1883, Puton 1892, Hoberlandt 1956, Lodos *et al.* 1978, Önder *et al.* 1983, 1995, Dursun & Kartal 2008a, Dursun & Fent 2011a, Tezcan *et al.* 2013, Yazıcı *et al.* 2014).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Italy, Macedonia, Montenegro, Portugal, Romania, Serbia, Slovenia, Spain. North Africa: Algeria, Egypt, Morocco Tunisia. Asia: Asian Türkiye, Iran, Iraq, Israel, Syria.

Neottiglossa flavomarginata (Lucas, 1849)

Asian Türkiye: Asia Minor (Hoberlandt 1956), Ankara, Bursa (Seidenstücker 1960, Kıyak 1993).

General Distribution: Europe: Bosnia Hercegovina, Bulgaria, France, Greece, Italy, Macedonia, Portugal, Romania, Serbia, Spain. North Africa: Algeria, Morocco, Tunisia. Asia: Asian Türkiye.

Neottiglossa leporina (Herrich-Schaeffer, 1830)

European Türkiye: Kırklareli (Fent & Aktaç 2007b).

Asian Türkiye: Ankara, Amasya, Bartın, Bolu, Bursa, Çankırı, Diyarbakır, Elazığ, Erzurum, Iğdır, Kahramanmaraş, Karabük, Kars, Kastamonu, Muğla, Ordu, Samsun, Sinop, Tokat, Zonguldak (Horváth 1883, 1901, Kiritshenko 1918, Hoberlandt 1956, Lodos *et al.* 1998, Kıyak 1993, Önder *et al.* 1995, Dursun & Kartal 2008a, Külekçi *et al.* 2009, Fent 2010, Dursun & Fent 2011a, Tezcan *et al.* 2013, Küçükbasmacı & Kıyak 2015, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete?, Croatia, Czech Republic, European Kazakhstan, European Türkiye, France, Germany, Greece, Hungary, Italy, Liechtenstein, Luxembourg, Macedonia, Moldavia, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NE NO NW), Georgia, Iran, Iraq, Kirgizia, Korea, Mongolia, Russia (ES FE WS), Tadzhikistan, Uzbekistan.

Neottiglossa lineolata (Mulsant & Rey, 1852)

European Türkiye: Edirne, İstanbul (Fent & Aktaç 2007b; Fent & Dursun 2016).

Asian Türkiye: Karabük (Fent 2010).

General Distribution: Europe: Bosnia Hercegovina, Bulgaria, European Türkiye, France, Germany, Italy, Montenegro, Portugal, Romania, Russia (ST: Caucasus), Serbia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Tunisia. Asia: Asian Türkiye, Azerbaijan, Georgia.

Neottiglossa pusilla (Gmelin, 1790)

Asian Türkiye: Ankara, Antalya, Kars (Kıyak 1993, Hoberlandt 1956, Önder *et al.* 2006, Şerban 2010).

General Distribution: Europe: Austria, Belgium, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Great Britain, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Norway, Poland, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO NW), Georgia, Kirgizia, Korea, Mongolia, Russia (ES FE WS), Tadzhikistan.

Tribe CAPPAEINI Atkinson
Genus *Halyomorpha* Mayr
Halyomorpha halys (Stål, 1855)

European Türkiye: İstanbul (Çerçi & Koçak, 2017, Çerçi *et al.* 2021).

Asian Türkiye: Ankara, Aydın, Artvin, Bartın, Bursa, Eskişehir, Giresun, İstanbul, İzmir, Ordu, Rize, Samsun, Trabzon, Yalova (Güncan & Gümüş 2019, Ak *et al.* 2019, Göktürk & Tozlu 2019, Göktürk 2020, Çerçi 2021, Çerçi *et al.* 2021, Özdemir & Tuncer 2021, Dursun, 2021).

General Distribution: Europe (introduced): Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Croatia, Czech Republic, European Türkiye, France, Germany, Greece, Hungary, Iceland, Italy, Liechtenstein, Macedonia, Malta, Netherlands, Poland, Portugal, Romania, Russia (ST), Sardinia, Serbia, Sicily, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Egypt?, Morocco. Asia: Asian Kazakhstan, Asian Türkiye, China (CE NE NO SE SW WP), Georgia, Japan, Korea, Taiwan. Extralimital: Vietnam, North America (introduced: Canada, USA), South America (introduced: Chili).

Note: Introduced species in the Turkish fauna.

Tribe CARPOCORINI Mulsant & Rey
Genus *Agatharchus* Stål

Subgenus *Agatharchus* Stål

Agatharchus escalerae Horváth, 1901

Asian Türkiye: Adana, Gümüşhane, Kahramanmaraş (Horváth 1901, Hoberlandt 1956, Awad 2000, Önder *et al.* 2006).

General Distribution: Asia: Asian Türkiye, Iran.

Agatharchus herrichii (Kolenati, 1846)

Asian Türkiye: Adana, Ankara, Diyarbakır, Eskişehir, Erzurum, İçel, Kahramanmaraş, Karaman, Kayseri, Konya, Muş, Tokat (Kiritshenko 1924 as *A. montanus*, Hoberlandt 1956, Seidenstücker 1958 as *A. montanus*, Önder *et al.* 1995, Lodos *et al.* 1998, Awad 2000, Önder *et al.* 2006 as *A. montanus*, Gözüaçık *et al.* 2011).

General Distribution: Europe: Russia (ST: Dagestan). Asia: Armenia, Asian Türkiye, Azerbaijan, Georgia, Iran, Syria.

Agatharchus linea (Klug, 1845)

Asian Türkiye: Bingöl, Kars, Niğde (Kiritshenko 1938, Hoberlandt 1956, Seidenstücker 1960, Önder *et al.* 2006, Özgen & Dioli 2018).

General Distribution: Asia: Asian Türkiye, Iran, Lebanon, Syria.

Agatharchus ponticus Belousova, 1999

Asian Türkiye: Elazığ, Erzurum (Belousova 1999, Rider 2006, Dursun & Fent 2017, Çerçi & Özgen 2021).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia.

Agatharchus tritaenia Horváth, 1897

Asian Türkiye: Hatay, Gaziantep, (Horváth 1897, Hoberlandt 1956, Önder *et al.* 1995, 2006).

General Distribution: Asia: Asian Türkiye, Iran, Iraq, Syria.

Genus *Antheminia* Mulsant & Rey

Antheminia lunulata (Goeze, 1778)

Material examined: Edirne: Center-Suakacağı (150 m): 05.07.1997, 2 ♀♀, 2 ♂♂, 01.09.2001, ♂; Güllapoğlu (41 m): 06.06.2002, ♀; Enez (30 m): 30.05.1993, ♂; Lalapaşa- Ömeroba (310 m) 02.08.2000, ♀; İstanbul: Çatalca-Binkılıç (125 m): 18.09.2001, ♀; Silivri-Beyciler (140 m): 15.08.1997, ♀; Kırklareli: Center- Çukurpınar (500 m): 25.08.1998, 2 ♀♀; Kofçaz-Erikler (430 m): 02.08.2000, ♀; Lüleburgaz-Ceylanköy (70 m): 26.08.1998, 3 ♀♀, 2 ♂♂; Çengelli (50 m): 16.08.2000, ♂; Vize (200 m): 27.08.1998, ♂; Tekirdağ: Hayrabolu-Dambaslar (110 m): 16.08.1997, 2 ♂♂; Malkara-Izgar Village (200 m): 28.07.1998, 5 ♀♀, ♂; Hasköy (250 m): 26.09.1992, ♀, 3 ♂♂; Mahramlı (230 m): 30.07.1998, ♀, ♂; Danişment (Korudağı) (250 m): 15.09.2001, ♂.

European Türkiye: Çanakkale, Edirne, Kırklareli, İstanbul (Fahringer 1922, Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999, Fent 2011),

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Ağrı, Amasya, Ankara, Artvin, Burdur, Bursa, Çankırı, Denizli, Diyarbakır, Elazığ, Erzurum, Eskişehir, Giresun, Iğdır, Isparta, Kahramanmaraş, Kayseri, Kırşehir, Kocaeli, Manisa, Mardin, Muş, Nevşehir, Niğde, Samsun, Sivas, Şanlıurfa, Tokat, Van (Horváth 1883, Kiritshenko 1918, Fahringer 1922, Hoberlandt 1956, Linnavuori 1965, Lodos *et al.* 1978, 1998, Kıyak 1990, Awad 2000, Dursun & Kartal 2008b, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Yazıcı *et al.* 2014, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Crete, Croatia, Czech Republic, European Kazakhstan, European Türkiye, France, Germany, Greece, Hungary, Italy, Macedonia, Moldavia, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Georgia, Iran, Iraq, Kirgizia, Russia (ES WS) Syria. Extralimital: Pakistan.

Antheminia pusio pusio (Kolenati, 1846)
= *Codophila pusio* (Kolenati, 1846)

European Türkiye: Edirne (Fent & Aktaç 2002).

Asian Türkiye: Afyonkarahisar, Ankara, Çankırı, Çorum, Diyarbakır, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Iğdır, İzmir, Kahramanmaraş, Karaman, Kars, Kastamonu, Kayseri, Konya, Mardin, Nevşehir, Niğde, Sivas (Hoberlandt 1956 as *Carpocoris* (*Antheminia*) *absinthii orientalis* and *Carpocoris pusio*, Seidenstücker 1960 as *C. pusio*, Kıyak 1990, Önder *et al.* 1995, 2006, Lodos *et al.* 1998, Awad 2000, Külekçi *et al.* 2009 as *Codophila pusio*, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019).

General Distribution: Europe: European Kazakhstan, European Türkiye, Macedonia, Russia (ST). Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Georgia, Iran, Iraq, Kirgizia, Mongolia, Russia (WS), Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Pakistan.

Antheminia varicornis (Jakovlev, 1874)

Asian Türkiye: Ankara, Bursa (Hoberlandt 1956 as *Dolycoris varicornis*).

General Distribution: Europe: Albania, Austria, Bulgaria, European Kazakhstan, Germany?, Greece, Hungary, Italy, Romania, Russia (ST), Serbia, Ukraine. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NE NO NW WP), Iran, Kirgizia, Korea, Mongolia, Russia (ES FE WS), Sinai, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Genus *Brachynema* Mulsant & Rey

Brachynema cinctum (Fabricius, 1775)

Asian Türkiye: Amasya, Çorum, Erzurum (Dursun & Kartal 2008b, Yazıcı *et al.* 2014).

General Distribution: Europe: Crete, Croatia, France, Greece, Italy, Malta, Spain. North Africa: Algeria, Canary Islands, Egypt, Libya, Morocco, Tunisia. Asia: Afghanistan, Asian Türkiye, Cyprus, Iran, Iraq, Israel, Saudi Arabia, Sinai, Syria, Yemen. Extralimital: Cape Verde Is, Ethiopia, Pakistan, Somalia, Sudan.

Brachynema germarii (Kolenati, 1846)
=*Brachynema virens* (Klug, 1845)

Material examined: Iğdır: Tuzluca (870 m): 28.07.2009, 4 ♀♀, 3 ♂♂.

Asian Türkiye: Ankara, Aydın, Çorum, Iğdır, Kahramanmaraş, Kayseri, Kırıkkale, Konya, Nevşehir, Niğde, Şanlıurfa, (Hoberlandt 1956, 1961 as *Brachynema virens and B.virens* var. *alternatum*, Linnavuori 1954 as *B. virens*, Seidenstücker 1960, Önder *et al.* 1995, 2006 as *B. virens*, Lodos *et al.* 1998 as *B. virens*, Awad 2000, Dursun & Kartal 2008b as *B. virens*, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Crete, European Kazakhstan, France, Greece, Italy, Portugal, Russia (ST), Ukraine. North Africa: Algeria, Canary Islands, Egypt, Libya, Morocco, Tunisia. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO NW WP), Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kirgizia, Mongolia, Russia (ES), Sinai, Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Pakistan.

Brachynema signatum Jakovlev, 1879

Asian Türkiye: Iğdır (Çerçi & Gözüaçık 2019).

General Distribution: Europe: Russia (ST: Dagestan). Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Georgia, Iran, Turkmenistan.

Genus *Carpocoris* Kolenati
Subgenus *Carpocoris* Kolenati
Carpocoris coreanus Distant, 1899
=*Carpocoris iranus* Tamanini, 1958

Asian Türkiye: Adıyaman, Ardahan, Diyarbakır, Elazığ, Erzurum, Gaziantep, Hatay, Iğdır, Kahramanmaraş, Kilis, Mardin, Siirt, Şanlıurfa, Şırnak (Wagner 1959 as *C. coreanus iranus*, Lodost *et al.* 1998 as *C. iranus*, Önder *et al.* 1995, 2006 as *C. iranus*, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Çerçi *et al.* 2018, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021, Çerçi & Özgen 2021).

General Distribution: Europe: Russia (ST). Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO NW WP), Georgia, Iran, Iraq, Israel, Jordan, Kirgizia, Mongolia, Russia (ES WS), Sinai, Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Pakistan.

Carpocoris fuscispinus (Boheman, 1851)

Asian Türkiye: Adana, Adıyaman, Ağrı, Amasya, Ankara, Antalya, Ardahan, Aydın, Bayburt, Bitlis, Burdur, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hakkari, Hatay, Iğdır, Isparta, Kahramanmaraş, Karaman, Kars, Kastomonu, Kayseri, Kırıkkale, Kırşehir, Konya, Mersin, Muğla, Muş, Nevşehir, Niğde, Sakarya, Sivas, Şanlıurfa, Tokat, Van, Yozgat (Horváth 1894, 1905, Kiritshenko 1918, 1924, Fahringer 1922, Hoberlandt 1956, Linnavuori 1965, Kıyak 1990, 2000, 2016, Lodost *et al.* 1978, 1998, Önder *et al.* 1995, Awad 2000, Kıyak *et al.* 2004, Dursun & Kartal 2008b, Demirel, 2009, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Poland, Portugal, Romania, Russia (CT NT ST), Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Egypt, Libya, Morocco. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO NW), Georgia, Iran, Iraq, Israel, Kirgizia, Korea, Lebanon, Mongolia, Russia (ES WS), Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: India, Pakistan.

Carpocoris mediterraneus mediterraneus Tamanini, 1958

Material examined: Çanakkale: Eceabat-between Alçıtepe-Kabatepe (50 m): 12.08.2001, 2 ♀♀, 3 ♂♂; Kemalyeri (60 m): 12.08.2001, ♂; Gelibolu-Cumalı (40 m): 07.06.2001 2 ♂♂; Fındıklı (105 m): 07.06.2001, ♂; Kavak (20 m): 07.06.2001, ♀; Ilgardere (20 m): 08.06.2001, 2 ♀♀, 2 ♂♂; Kocaçeşme (Korudağı) (350 m): 10.08.2001, 3 ♀♀, 3 ♂♂; 20.05.2003, ♂; Edirne: Center-Suakacağı (150 m): 05.07.1997, ♀; 01.09.2001, ♂; Balkan Campus (41 m) 23.07.2001 ♂; 06.06.2002, ♀; Değirmenyeri (120 m): 01.09.2001, 2 ♂♂; Söğütlük (41 m): 12.09.2001, ♂; Sarayiçi (Tavukormanı) (41 m): 07.05.2002, ♀, 21.05.2002, ♂; Keşan (Korudağı) (300 m): 07.06.2001, ♀; Küçükyerlisu (210 m): 20.05.2003, 2 ♀♀; Lalapaşa- Doğanköy (350 m): 05.07.1997, 3 ♂♂; Sinanköy (300 m): 02.08.2000, ♂; Kalkansöğüt (400 m): 05.07.1992, ♀; Ömeroba (310 m): 02.08.2000, ♀; Süleoğlu-Baraj (175 m): 24.05.2002, 2 ♀♀, 4 ♂♂; İstanbul: Silivri- (50 m): 25.08.1992, 2 ♀♀, 3 ♂♂; Küçüksinekli (170 m): 25.08.1992, 3 ♀♀, 2 ♂♂; Beyciler (140 m): 15.08.1997, ♀, ♂; Çantaköy (50 m): 28.08.1998, ♂; Çatalca-Subaşı (100 m): 03.10.1992, ♀, ♂; Danamandıra (150 m): 15.08.1998, 4 ♀♀, 2 ♂♂; Durusu (110 m): 29.08.1998 2 ♂♂; Ömerli (80 m): 15.06.2001, ♂; Kırklareli: Center-Ürünlü (60 m): 21.08.1992, 4 ♀♀, 2 ♂♂; 27.06.2002, ♀, ♂; Çağlayık (620 m): 25.08.1998, ♀; 17.07.2001, 2 ♀♀; Dereköy (300 m): 17.07.2001, ♀; Kaynarca (125 m): 27.06.2002, 4 ♂♂; Demirköy-Yiğitbaşı (400 m): 06.07.1997, 2 ♀♀, 2 ♂♂; Balaban (450 m): 06.07.1997, ♀; 27.07.2001, 2 ♀♀; Sislioba (400 m): 27.07.2001, 2 ♀♀, ♂; between Yeşilce-Avcılar (350

m): 25.07.2001, 2 ♀♀; İğneada (0 m): 25.07.2001, 2 ♀♀; Balaban (Velika Deresi) (500 m): 26.05.2002, ♂; Kofçaz (500 m): 02.08.2000, ♂; 29.06.2002, ♀, ♂; Erikler (430 m): 02.08.2000, 3 ♀♀, 3 ♂♂; between İnece-Paşayeri (95 m): 02.08.2000, 2 ♀♀; Ahmetler (570 m): 17.07.2001, ♂; Beyci (350 m): 17.07.2001, ♀, 3 ♂♂; Lüleburgaz-Büyükkarıştıran (75 m): 06.07.1997, ♂; Ahmetbey (100 m): 12.08.1997, ♀; Sarıcaali (50 m): 13. 08.1997, ♀; Ceylanköy (70 m): 26.08.1998, ♀, ♂; Çengelli (50 m): 16.08.2000; Kırık (190 m): 28.08.2002, ♀, 2 ♂♂; Evrensekiz (90 m): 21.08.1992, ♀; Pınarhisar-Yenice (450 m): 06.07.1997, ♀; Poyralı (310 m): 27.06.2002, 4 ♂♂; Üsküp-Kurudere (320 m): 27.06.2002, ♂; Hacıfakılı (300 m): 27.06.2002, ♀, ♂; Vize (200 m): 27.08.1998 ♀, ♂; Mahya Hill (700 m): 07.06.2003, ♂; Tekirdağ: Center-Kaşıkçı (190 m): 26.08.1992, ♀; Köseilyas (50 m): 02.08.1998, ♂; Uçmakdere (300 m): 06.08.1998, ♀; Nusratfakı (120 m): 09.06.2001, ♀; Oruçbeyli (200 m): 07.08.2001, 3 ♀♀; Işıklar (Ganos Mountains) (200 m): 18.05 2003, 2 ♀♀; Çerkezköy-Veliköy (130 m): 11.08.1997, ♀, 2 ♂♂; Hayrabolu-Dambaslar (110 m): 16.08.1997, ♀; Tatarlı (210 m): 29.07.1998, ♀; Hedeyli (150 m): 23.05.2002, ♀; Malkara-Demircili (200 m): 24.08.1992, ♀, 2 ♂♂; Izgar Village (200m): 28.07.1998, ♀, ♂; 05.05.2001, ♀; Şahin (200 m): 29.07.1998, ♂; between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♀; Mahramlı (230 m): 30.07.1998, ♂; Mahramlı (Cumhuriyet Ormanı) (230 m): 07.08.2001, 2 ♂♂; Sağlamtaş (170 m): 08.08.2001, ♀; Karacahalil (210 m): 14.09.2001, ♂; 19.05.2003, ♂; Danişment (Korudağı) (250 m): 15.09.2001, ♀, ♂; Muratlı-Hanoğlu (60 m): 09.06.2001, ♀; Saray-Sinanlı (105 m): 11.09.1997, ♀, ♂; Büyükyoncalı (200 m): 26.08.1998, ♀; Şarköy-Ormanlı (200 m): 08.08.2001, ♀; Ulaman (100 m): 09.08.2001, ♀; Yayaköy (230 m): 09.08.2001, ♂; Yeniköy (200 m): 10.08.2001, ♀.

European Türkiye: Çanakkale, Edirne, Kırklareli, Tekirdağ (Lodos *et al.* 1978, Fent & Aktaç 1999, Awad 2000, Fent 2011, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bartın, Bayburt, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çorum, Denizli, Düzce, Diyarbakır, Elazığ, Erzincan, Erzurum, Gaziantep, Giresun, Gümüşhane, Hatay, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Konya, Kütahya, Manisa, Mersin, Muğla, Muş, Ordu, Osmaniye, Sakarya, Samsun, Sinop, Sivas, Tokat, Trabzon, Yalova, Zonguldak (Linnavuori 1965, Wagner 1966, Kıyak 1990, 2000, 2016, Lodos *et al.* 1978, 1998, Önder *et al.* 1995, Awad 2000, Dursun & Kartal 2008b, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Tezcan *et al.* 2013, Yazıcı *et al.* 2014, Bulak & Yıldırım 2021).

General Distribution: Europe: Albania, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Hungary, Italy, Malta, Macedonia, Moldavia, Romania, Russia (ST: Caucasus), Slovakia, Slovenia, Spain, Ukraine. North Africa: Algeria, Egypt, Morocco. Asia: Armenia, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Lebanon, Sinai, Syria, Turkmenistan. Extralimital: Ethiopia.

Carpocoris melanocerus (Mulsant & Rey, 1852)

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Fent & Aktaç, 2007b).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Artvin, Bolu, Burdur, Çankırı, Çorum, Elazığ, Erzincan, Erzurum, Giresun, Gümüşhane, Hatay, Iğdır, Isparta, İçel, İzmir, Kahramanmaraş, Kastamonu, Kars, Kırıkkale, Konya, Niğde, Malatya, Manisa, Muğla, Muş, Sinop, Sivas, Tokat (Kiritshenko 1918, 1924, Hoberlandt 1956, Kıyak 1990, 2016, Lodos *et al.* 1998, Awad 2000, Dursun & Kartal 2008b, Külekçi *et al.* 2009, Fent 2010, Dursun & Fent 2011a).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Croatia, European Türkiye, France, Germany, Italy, Liechtenstein, Macedonia, Montenegro, Poland, Portugal, Romania, Russia (ST: Caucasus), Serbia, Slovakia, Slovenia, Spain, Sweden, Ukraine? North Africa: Algeria. Asia: Afghanistan, Armenia, Asian Türkiye, Azerbaijan, Georgia.

Carpocoris pudicus (Poda, 1761)

Material examined: Edirne: Keşan-Sazlıdere (10 m): 31.05.1999, ♀; Lalapaşa- Hacıdanişment (500 m): 21.07.1993, ♀; Doğanköy (350 m): 05.07.1997, ♀; 01.09.2001, ♂; Ömeroba (310 m): 02.08.2000, ♀; Kırklareli: Center-Kuzucu (300 m): 25.08.1998, ♀, ♂; Çağlayık (620 m): 17.07.2001, ♂; Dereköy (300 m): 17.07.2001, ♂; Kaynarca (125 m): 27.06.2002, ♂; Demirköy-Yiğitbaşı (400 m): 06.07.1997, ♀, ♂; Sergen (290 m): 29.08.2002, 3 ♂♂; Kofçaz-Erikler (430 m): 02.08.2000, ♀; Pınarhisar-Yenice (450 m): 06.07.1997, ♂; Poyralı (310 m): 27.06.2002, ♂; Mahya Hill (700 m): 07.06.2003, ♂; Mahya Hill (800 m): 07.06.2003, ♀; Mahya Hill (880 m): 07.06.2003, ♂; Üsküp-Kurudere (320 m): 27.06.2002, ♀, 2 ♂♂; Vize-between Kıyıköy-Kömürköy (200 m): 16.06.2001, ♀; Tekirdağ: Saray-Büyükyoncalı (200 m): 26.08.1998, ♂; Aydınlar (125 m): 28.08.1998, ♂; Muratlı-Arzulu (50 m): 09.06.2001, ♀.

European Türkiye: Edirne, İstanbul, Tekirdağ (Hoberlandt 1956, Kıvan 1998, Fent & Aktaç 1999, Awad 2000, Yazıcı *et al.* 2014).

Asian Türkiye: Adana, Adıyaman, Ağrı, Amasya, Antalya, Ankara, Ardahan, Artvin, Aydın, Balıkesir, Bartın, Bolu, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Elazığ, Erzincan, Erzurum, Gaziantep, Giresun, Gümüşhane, Hakkari, Hatay, Iğdır, Isparta, İstanbul, İzmir, Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Kayseri, Kocaeli, Konya, Mardin, Mersin, Muğla, Muş, Nevşehir, Niğde, Ordu, Samsun, Sivas, Şanlıurfa, Tokat, Tunceli, Yozgat, Zonguldak (Puton 1892, Escherich 1897, Horváth 1883, 1901, 1918, 1919, Kiritshenko 1918, 1924, Fahringer 1922, Hoberlandt 1956, Wagner 1959, Kıyak 1990, 1993, 2000,

2016, Önder *et al.* 1995, Lodos *et al.* 1998, Awad 2000, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Özgen *et al.* 2005a, b, Bolu *et al.* 2006, Dursun & Kartal 2008b, Demirel, 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi *et al.* 2018, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Crete, Croatia, Czech Republic, European Türkiye, France, Germany, Greece, Hungary, Italy, Macedonia, Moldavia, Montenegro, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Egypt. Asia: Armenia, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Lebanon, Syria.

Carpocoris purpureipennis (De Geer, 1773)

Material examined: Edirne: Lalapaşa-Doğanköy (350 m): 01.09.2001, ♂; Uzunköprü- Eskiköy (70 m): 23.05.1994, ♂; İstanbul: Çatalca-Danamandıra (150 m): 15.08.1998, ♂; Durusu (110 m): 14.06.2001, ♂; Kırklareli: Center-Çağlayık (620 m): 25.08.1998, ♀, 2 ♂♂; Kuzucu (300 m): 25.08.1998, ♀; Demirköy-İğneada (0 m): 25.07.2001, ♀; Kofçaz (500 m): 29.06.2002, ♀, ♂; Lüleburgaz-Kırık (190 m): 28.08.2002, ♀, ♂; Pınarhisar-Yenice (450 m): 06.07.1997, ♂; Vize (200 m): 27.08.1998, ♀; Tekirdağ: Center-Nusratfakı (120 m): 09.06.2001, ♂; Malkara-Izgar Village (200 m): 28.07.1998, ♂; Muratlı-Hanoğlu (60 m): 09.06.2001, 2 ♂♂; Saray-Aydınlar (125 m): 28.08.1998, 2 ♀♀; Şahin (200 m): 29.07.1998, ♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Lodos *et al.* 1978, Fent & Aktaç 1999, Awad 2000, Fent 2011, Yazıcı *et al.* 2014).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bartın, Bayburt, Bilecik, Bitlis, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Düzce, Elazığ, Erzincan, Erzurum, Gaziantep, Giresun, Gümüşhane, Hatay, Iğdır, Isparta, İçel, İzmir, Kahramanmaraş, Karaman, Karabük, Kars, Kastamonu, Kayseri, Konya, Kütahya, Manisa, Mardin, Mersin, Muğla, Nevşehir, Niğde, Ordu, Osmaniye, Samsun, Sinop, Sivas, Şanlıurfa, Tokat, Trabzon, Tunceli, Yalova, Yozgat, Zonguldak (Wagner 1959, Lodos *et al.* 1978, 1998, Kıyak 1990, 2000, Önder *et al.* 1995, Awad 2000, Özgen *et al.* 2005b, Bolu *et al.* 2006, Dursun & Kartal 2008b, Karsavuran *et al.* 2008, Demirel, 2009, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015)

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, Estonia, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Libya, Morocco. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NE NO NW), Cyprus, Georgia, Iran, Israel, Japan, Kirgizia, Korea, Kuwait, Mongolia, Russia (ES FE WS), Syria, Uzbekistan. Extralimital: Pakistan.

Genus *Chlorochroa* Stål
Subgenus *Rhytidolomia* Stål
Chlorochroa juniperina juniperina (Linnaeus, 1758)
=*Pitedia juniperina* (Linnaeus, 1758)

Material examined: Amasya: Taşova-Hacıbey (310 m), 09.07.2021, 2 ♀♀; Gümüşhacıköy-Maden (810 m), 07.09.2021, 2 ♀♀ ♂.

Asian Türkiye: Bursa, Çorum, Erzurum, Iğdır, Kastamonu, Tokat (Horváth 1883 as *Pitedia juniperina*, Hoberlandt 1956, Lodos *et al.* 1998, Awad 2000, Önder *et al.* 2006 and Dursun & Kartal 2008b as *P. juniperina*, Dursun & Fent 2011a, Yazıcı *et al.* 2014).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Great Britain?, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Montenegro, Netherlands, Norway, Poland, Portugal Romania, Russia (CT NT ST) Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO), Georgia, Iran, Korea, Mongolia, Russia (ES FE WS).

Chlorochroa pinicola (Mulsant & Rey, 1852)
=*Pitedia pinicola* (Mulsant & Rey, 1852)

Asian Türkiye: Adana, Amasya, Ankara, Bolu, Çanakkale, Gaziantep, Hatay, Konya (Fieber 1864, Puton 1892 and Hoberlandt 1956 as *Pitedia pinicola* var. *porphyrea*, Linnavuori 1965, Önder *et al.* 1995, 2006, Lodos *et al.* 1998 and Awad 2000 as *P. pinicola*).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Moldavia, Montenegro, Netherlands, Norway, Poland, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: Asian Kazakhstan, Asian Türkiye, Georgia, Russia (ES WS).

Genus *Chroantha* Stål
Chroantha ornatula (Herrich-Schaeffer, 1842)

Asian Türkiye: Hatay, Iğdır (Seidenstücker 1958, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Crete, Greece, Italy, Malta, Portugal, Russia (ST) Spain. North Africa: Canary Islands, Egypt, Libya, Madeira, Morocco, Tunisia. Asia: Afghanistan, Arab Emirates, Asian Türkiye, Azerbaijan, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Quatar, Saudi

Arabia, Sinai, Syria, Tadzhikistan, Turkmenistan, Uzbekistan, Yemen. Extralimital: Sudan.

Genus *Cnephosa* Jakovlev

Cnephosa flavomarginata Jakovlev, 1880

Asian Türkiye: Ankara, Bitlis, Diyarbakır, Elazığ, Erzincan, Hakkari, Kahramanmaraş, Kars, Konya, Manisa, Muş, Niğde, Şırnak, Zonguldak **(**Kiritshenko 1918, 1924, Hoberlandt 1956, Wagner 1959, Kıyak 1990, 2016, Lodos *et al.* 1998, Awad 2000, Külekçi *et al.* 2009, Yazıcı *et al.* 2014).

General Distribution: Asia: Armenia, Asian Türkiye, Azerbaijan, Iran.

Genus *Codophila* Mulsant & Rey

Codophila maculicollis (Dallas, 1851)

Asian Türkiye: Artvin, Bilecik, Denizli, Erzincan, Erzurum, Isparta, Kars, Tunceli (Yazıcı *et al.* 2014).

General Distribution: North Africa: Algeria, Egypt, Libya, Morocco, Tunisia. Asia: Afghanistan, Asian Türkiye, China (NW)?, Iran, Israel, Jordan, Saudi Arabia, Sinai, Syria, Yemen. Extralimital: Ethiopia, India, Sudan.

Codophila varia (Fabricius, 1787)

Material examined: Çanakkale: Eceabat-Alçıtepe (50 m): 12.08.2001, ♀; Kemalyeri (60 m): 12.08.2001, ♂; Gelibolu-Kocaçeşme (Korudağı) (350 m): 10.08.2001, 2 ♂♂; Ilgardere (20 m): 11.08.2001, 4 ♀♀, 2 ♂♂; Edirne: Center-Balkan Campus (41 m): 23.07.2001, ♂, 12.09.2001, ♀; Değirmenyeri (120 m): 01.09.2001, ♀, ♂; Uzunbayır (200 m): 03.07.1997, 2 ♀♀, ♂; Suakacağı (150 m): 05.07.1997, ♀, ♂, 01.09.2001, 2 ♀♀, 2 ♂♂; Lalapaşa-Doğanköy (350 m): 05.07.1997, ♀, 01.09.2001, ♂; Ömeroba (310 m): 02.08.2000, ♀, ♂; Süleoğlu-Baraj (175 m): 25.08.2002, 2 ♀♀, ♂; İstanbul: Çatalca-Binkılıç (125 m): 03.10.1992, ♀, ♂; Karacaköy (100 m): 03.10.1992, ♂; Kırklareli: Center-Ürünlü (60 m): 21.08.1992, ♂; Çukurpınar (500 m): 25.08.1998, ♀, ♂; Kızılcıkdere (200 m): 11.05.2001, 2 ♀♀; Demirköy-İğneada (0 m): ♀; between Yeşilce-Avcılar (350 m): 25.07.2001, ♀, 2 ♂♂; Kofçaz-Erikler (430 m): 02.08.2000, ♀, ♂; Beyci (350 m): 19.07.2001, ♀; Lüleburgaz- Sarıcaali (50 m): 13.08.1997, ♀, ♂; Ceylanköy (70 m): 26.08.1998, ♂; Kırık (190 m): 28.08.2002, 2 ♂♂; Pınarhisar-Mahya Hill (1030 m): 07.06.2003, ♀; Vize-between Kıyıköy-Kömürköy (200 m): 16.06.2001, ♀; Tekirdağ: Center-Işıklar (Ganos Mountains) (200 m): 18.05 2003, ♂; Hayrabolu-Umurca (30 m): 23.05.2002, ♂; Malkara-Izgar Village (200 m): 28.07.1998, ♀, ♂; 05.05.2001, ♀; Hasköy (250 m): 26.09.1992, ♀; Şahin (200 m): 29.07.1998, ♀, ♂; Karacahalil (210 m): 14.09.2001, 2 ♀♀, 2 ♂♂; between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♂; Mahramlı (230 m): 30.07.1998, ♀, ♂; Yenidibek (210 m): 14.09.2001, ♂; Danişment (Korudağı) (250 m): 15.09.2001, 4 ♀♀; between Pınarca-Safaalan (100 m): 18.09.2001, ♂; Saray (180 m): 16.06.2001, 2 ♀♀, ♂; Şarköy (0 m): 30.07.1998, ♀, ♂; Emirali (200 m): 30.07.1998, ♀, ♂.

European Türkiye: Çanakkale, Edirne, Kırklareli (Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999, Awad 2000, Fent 2011).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Aydın Balıkesir, Bilecik, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Elazığ, Eskişehir, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hakkari, Hatay, Iğdır, Isparta, İçel, İzmir Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Kayseri, Kırşehir, Kilis, Kocaeli, Konya, Kütahya, Manisa, Mardin, Mersin, Muğla, Nevşehir, Osmaniye, Sakarya, Samsun, Siirt, Sinop, Sivas, Tokat, Tunceli Zonguldak (Puton 1892, Kiritshenko 1918, Fahringer 1922, Linnavuori 1954, Hoberlandt 1956, Wagner, 1959, 1966, Lodos *et al.* 1978, 1998, Önder *et al.* 1983, 1995, Kıyak 1990, 1993, 2016, Awad 2000, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Dursun & Kartal 2008b, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi *et al.* 2018, Çerçi & Gözüaçık 2019, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Hungary, Italy, Malta, Macedonia, Moldavia, Montenegro, Portugal, Romania, Russia (ST), Serbia, Spain, Switzerland, Ukraine. North Africa: Algeria, Canary Islands, Egypt, Libya, Morocco, Tunisia. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kirgizia, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Genus *Dolycoris* Mulsant & Rey

Dolycoris baccarum (Linnaeus, 1758)

Material examined: Çanakkale: Eceabat-Behramlı (100 m): 08.06.2001, ♀, 2 ♂♂; Gelibolu-Cumalı (40 m): 07.06.2001, ♀; Edirne: Center-Avarız (55 m): 20.04.1994, ♀; Suakacağı (150 m): 05.07.1997, 2 ♀♀; Değirmenyeri (120 m): 01.09.2001, ♀; Sarayiçi (Tavukormanı) (41 m): 12.05.2002, ♂; Havsa-Köseömer (80 m): 30.08.1992, ♀; Lalapaşa-Doğanköy (350 m): 05.07.1997, 2 ♀♀; Sinanköy (300 m): 02.08.2000, ♀; Süleoğlu-Baraj (175 m): 24.05.2002, ♂; İstanbul: Gaziosmanpaşa-Boğazköy (60 m): 15.06.2001, ♂; Çatalca-Binkılıç (125 m): 03.10.1992, ♂; Danamandıra (150 m): 15.08.1998, ♀; Dağyenice (450 m): 03.10.1992, ♀; Kabakça (100 m): 28.08.1998, ♀; Durusu (110 m): 29.08.1998, ♂; Ormanlı (75 m): 29.08.1998, ♀; Ömerli (80 m): 15.06.2001, ♀, ♂; Silivri-Küçüksinekli (170 m): 25.08.1992, ♂; Kırklareli: Center-Ürünlü (60 m): 21.08.1992, 2 ♀♀; Beyci (350 m): 15.08.1997, ♀; Çukurpınar (500 m): 25.08.1998, ♀; Çağlayık (620 m): 25.08.1998, ♀; 17.07.2001, ♂; Kuzucu (300 m): 25.08.1998, ♀; Dereköy (300 m):17.07.2001, 2 ♂♂; Babaeski-Yeniköy (65 m): 11.05.2001, ♀; Demirköy (250 m): 06.07.1997, ♀; Yiğitbaşı (400 m): 06.07.1997, ♀; Balaban (450 m): 06.07.1997, 2 ♀♀; Balaban (Velika Deresi) (500 m): 26.05.2002, ♀; Balaban (700 m):

29.08.2002 ♀; Sivriler (350 m): 27.08.1998, ♂; Sislioba (400 m): 25.07.2001, ♀; between Yeşilce-Avcılar (350 m): 25.07.2001, ♀; Sarpdere (300 m): 26.05.2002, ♂; Kofçaz (500 m): 02.08.2000, ♂; Erikler (430 m): 02.08.2000, ♀; Beyci (350 m): 19.07.2001, 2 ♀♀; Lüleburgaz-Ahmetbey (100 m): 12.08.1997, ♀; Sarıcaali (50 m): 13.08.1997, ♀; Ceylanköy (70 m): 26.08.1998, ♀; Çengelli (50 m): 16.08.2000, ♀; Tozaklı (200 m): 29.08.2002, ♂; Pınarhisar-Yenice (450 m): 06.07.1997, ♂; Mahya Hill (700 m): 07.06.2003, ♀; Mahya Hill (800 m): 07.06.2003, ♂; Mahya Hill (880 m): 07.06.2003, ♀; Üsküp-Kurudere (320 m): 27.06.2002, ♂; Vize (200 m): 27.08.1998, ♀; Tekirdağ: Center-Köseilyas (50 m): 02.08.1998, ♂; Uçmakdere (300 m): 06.08.1998, ♂; Nusratfakı (120 m): 09.06.2001, 2 ♀♀; Oruçbeyli (200 m): 07.08.2001, 2 ♀♀; between Ormanlı-Hoşköy (700 m): 18.05.2003, ♀; Işıklar (Ganos Mountains) (200 m): 18.05 2003, ♀; Çerkezköy-Veliköy (130 m): 11.08.1997, ♀; Hayrabolu-Dambaslar (110 m): 16.08.1997, 2 ♂♂; Tatarlı (210 m): 29.07.1998, ♀; Malkara-Demircili (200 m): 24.08.1992, ♂; Şahin (200 m): 29.07.1998, ♀; Mahramlı (230 m): 30.07.1998, ♀, 07.08.2001, ♀; Elmalı (220 m): 14.09.2001, ♂; Yenidibek (210 m): 14.09.2001, ♀; Şarköy-between Emirali-Çınarlıdere (210 m): 31.05.1999, ♂; Ulaman (100 m): 09.08.2001, 2 ♀♀; Yayaköy (230 m): 09.08.2001, ♀; Yeniköy (200 m): 10.08.2001, ♀; Danişment (Korudağı) (250 m): 15.09.2001, ♀, ♂; Saray-Bahçeköy (190 m): 27.08.1997, ♀; Büyükyoncalı (200 m): 26.08.1998, ♂; Saray (180 m): 16.06.2001, ♀.

European Türkiye: Çanakkale**,** Edirne, İstanbul, Kırklareli, Tekirdağ (Hoberlandt 1956, Lodos *et al.* 1978, Kıvan 1998, Fent & Aktaç 1999, Awad 2000, Şerban 2010, Fent 2011, Yazıcı *et al.* 2014, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Ağrı, Aksaray, Amasya, Ankara, Antalya, Ardahan, Artvin, Aydın, Balıkesir, Batman, Bartın, Bayburt, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Düzce, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hatay, Hakkari, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Kayseri, Kilis, Kırıkkale, Kocaeli, Konya, Kütahya, Malatya, Manisa, Mardin, Mersin, Muğla, Muş, Nevşehir, Niğde, Ordu, Osmaniye, Sakarya, Samsun, Siirt, Sinop, Sivas, Şanlıurfa, Şırnak, Tokat, Trabzon, Tunceli, Uşak, Yozgat, Zonguldak (Puton 1892, Escherich 1897, Horváth 1901, 1905, 1919, Kiritshenko 1918, 1924, Fahringer 1922, Gadeau de Kerville 1939, Hoberlandt 1956, Wagner 1959, 1966, Linnavuori 1965, Lodos *et al.* 1978, 1998, Önder *et al.* 1981, 1995, Kıyak 1990, 2000, 2016, Awad 2000, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Özgen *et al.* 2005a, b, Bolu *et al.* 2006, Dursun & Kartal 2008b, Karsavuran *et al.* 2008, Demirel, 2009, Külekçi *et al.* 2009, Tezcan *et al.* 2010, 2013, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Fent & Japoshvili 2012, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Kaçar & Dursun 2015, Küçükbasmacı & Kıyak 2015, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Madeira. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (CE NE NO NW SE SW WP), Cyprus, Georgia, Iran, Iraq, Israel, Japan, Jordan, Korea, Lebanon, Mongolia, Russia (ES FE WS), Sinai, Syria, Taiwan. Extralimital: India, Pakistan.

Genus *Enigmocoris* Belousova

Enigmocoris fissiceps (Horváth, 1906)

= *Holcostehus fissiceps* (Horváth, 1906)

Asian Türkiye: İzmir, Kayseri, Manisa (Horváth 1905, Hoberlandt 1956, Seidenstücker 1960, Awad 2000 as *Holcostehus fissiceps*).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia. *Holcostethus fissiceps* was transferred to the newly proposed genus *Enigmocoris* by Belousova (2007).

Genus *Holcogaster* Fieber

Holcogaster fibulata (Germar, 1831)

=*Holcogaster exilis* Horváth, 1903

Material examined: Çanakkale: Gelibolu-Şadıllı (140 m): 19.05.2003, ♀, 3 ♂♂; Tekirdağ: Malkara-Yenidibek (210 m): 14.09.2001, 6 ♀♀, 4 ♂♂; Danişment (Korudağı) (250 m): 15.09.2001, 25 ♀♀, 38 ♂♂; Karacahalil (Koru Dağı) (300 m): 19.05.2003, 5 ♀♀, 14 ♂♂.

European Türkiye: Tekirdağ, İstanbul Kırklareli, (Horváth 1918, Lodos *et al.* 1978, Awad 2000).

Asian Türkiye: Adana, Amasya, Antalya, Balıkesir, Burdur, Çanakkale, Çorum, Elazığ, Eskişehir, Gaziantep, Hatay, Isparta, İçel, İzmir, Kahramanmaraş, Karaman, Kastamonu, Manisa, Mersin, Muğla, Niğde, Sakarya, Samsun, Sinop, Sivas, Tokat (Puton 1892, Hoberlandt 1956, Seidenstücker 1957, Linnavuori 1965, Lodos *et al.* 1978, 1998, Önder *et al.* 1983, 1995, Awad 2000, Dursun & Kartal 2008b, Karsavuran *et al.* 2008, Dursun & Fent 2011a, Matocq *et al.* 2014, Çıtırıkkaya *et al.* 2015, Çerçi *et al.* 2018).

General Distribution: Europe: Albania, Belgium, Bulgaria, Crete, Croatia, European Türkiye, France, Germany, Greece, Italy, Macedonia, Montenegro, Netherlands, Portugal, Spain, Switzerland. North Africa: Algeria, Canary Islands, Libya, Morocco, Tunisia. Asia: Asian Türkiye, Cyprus, Iraq, Israel, Syria.

Note: This species was given as *Holcogaster exilis* by Seidenstücker (1957), Linnavuori (1965), Lodos *et al.* (1978, 1998), Önder *et al.* (1983), Awad (2000), Dursun & Kartal (2008b), Karsavuran *et al.* (2008), Matocq *et al.* (2014) and Çıtırıkkaya *et al.* (2015). *H. exilis* was synonymized by Ribes & Gapon (2006) with *Holcogaster fibulata*.

Genus *Holcostethus* Fieber
Subgenus *Holcostethus* Fieber
Holcostethus albipes (Fabricius, 1781)

European Türkiye: İstanbul, Kırklareli, Tekirdağ (Fent & Aktaç 2007b, Yazıcı *et al.* 2014).

Asian Türkiye: Aydın, Çanakkale, Denizli, Erzurum, İçel, İzmir, Kayseri (Seidenstücker 1975, Lodos *et al.* 1978, 1998, Önder *et al.* 1983, Awad 2000, Özsaraç *et al.* 2001, Yazıcı *et al.* 2014).

General Distribution: Europe: Albania, Bosnia Hercegovina, Crete, Croatia, European Türkiye, France, Greece, Italy, Malta, Serbia, Slovenia, Spain, Ukraine. North Africa: Algeria, Morocco. Asia: Asian Türkiye, Syria.

Holcostethus sphacelatus (Fabricius, 1794)

European Türkiye: Kırklareli (Fent & Aktaç 2007b).

Asian Türkiye: Adana, Bilecik, İzmir, Osmaniye, Samsun (Lodos *et al.* 1998, Awad 2000, Dursun & Kartal 2008b).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Croatia, Czech Republic, European Türkiye, France, Germany, Greece, Hungary, Italy, Liechtenstein, Luxembourg, Macedonia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Morocco. Asia: Asian Türkiye, Iran.

Genus *Peribalus* Mulsant & Rey
Subgenus *Asioperibalus* Belousova
Peribalus hoberlandti (Lodos & Önder, 1980)

Asian Türkiye: Gümüşhane (Lodos & Önder 1980, Awad 2000 as *Holcostethus hoberlandti*).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia

Peribalus inclusus (Dohrn, 1860)

European Türkiye: Edirne, Tekirdağ (Awad 2000).

Asian Türkiye: Ağrı, Antalya, Aydın, Diyarbakır, Gaziantep, İzmir, Kahramanmaraş, Malatya (Kiritshenko 1918, Hoberlandt 1956, Seidenstücker 1975, Awad 2000 as *Holcostethus inclusus*).

General Distribution: Europe: European Kazakhstan, European Türkiye, Russia (CT ST), Ukraine. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO), Georgia, Iran, Mongolia, Russia (ES FE WS).

Subgenus *Peribalus* Mulsant & Rey
Peribalus strictus strictus (Fabricius, 1803)
= *Holcostethus strictus* (Fabricius, 1803)

European Türkiye: Edirne, Tekirdağ (Hoberlandt 1956, Fent & Aktaç 1999, Awad 2000, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Antalya, Aydın, Bayburt, Burdur, Çanakkale, Çorum, Denizli, Diyarbakır, Elazığ, Gaziantep, Giresun, Iğdır, İzmir, Karabük, Kastamonu, Manisa, Mardin, Mersin, Muğla, Samsun, Sivas, Tokat, Zonguldak (Puton & Noualhier 1895, Hoberlandt 1956, Önder *et al.* 1995, Lodos *et al.* 1998, Awad 2000, Dursun & Kartal 2008b, Fent 2010, Şerban 2010, Tezcan *et al.* 2010, 2013, Dursun & Fent 2011a, Matocq *et al.* 2014, Çerçi *et al.* 2018, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Italy, Macedonia, Montenegro, Portugal, Romania, Serbia, Slovenia, Spain. North Africa: Algeria, Libya, Morocco, Tunisia. Asia: Asian Türkiye, Cyprus, Iran, Iraq, Israel, Syria.

Peribalus strictus vernalis (Wolff, 1804)
=*Holcostethus vernalis* (Wolff, 1804)

Material examined: Çanakkale: Eceabat-Behramlı (100 m): 08.06.2001, ♀; Kemalyeri (60 m): 12.08.2001, 2 ♀♀; Edirne: Center-Avarız (55 m): 20.04.1994, ♀; Balkan Campus (41 m): 26.10.1994, ♂; Suakacağı (150 m): 05.07.1997, 3 ♂♂; Uzunbayır (200 m): 03.07.1997, ♂; Sarayiçi-Tavukormanı (41 m): 21.05.2002, ♂; Karaağaç (41 m): 21.05.2003, 2 ♀♀; Süleoğlu-Baraj (175 m): 25.08.2002, ♀, ♂; İstanbul: Çatalca-Binkılıç (125 m): 18.09.2001, ♀, 2 ♂♂; Kırklareli: Center-Kaynarca (125 m): 27.06.2002, ♀; Lüleburgaz-Çengelli (50 m): 16.08.2000, ♀; Ertuğrul (230 m): 26.08.2002, ♀; Babaeski-Yeniköy (65 m): 11.05.2001, ♀, ♂; Dereköy (300 m): 17.07.2001, ♀; Tekirdağ: Center- Işıklar (Ganos Mountains) (200 m): 18.05 2003, ♀; Saray-Sinanlı (105 m): 11.09.1997, 2 ♀♀, 2 ♂♂; Hayrabolu-Örenköy (200 m): 19.05.2002, ♀, ♂; Malkara-Izgar Village (200 m): 05.05.2001, 2 ♀♀, ♂; Mahramlı (Cumhuriyet Ormanı) (230 m): 07.08.2001, 2 ♀♀; Karacahalil (210 m): 14.09.2001 2♀♀; Elmalı (220 m): 14.09.2001, ♂; Muratlı-Aydınköy (70 m): 18.05.2002, ♀, 2 ♂♂; Saray-Sinanlı (105 m): 11.09.1997, 4 ♀♀, 3 ♂♂; Şarköy-Emirali (200 m): 30.07.1998, ♀; Yayaköy (230 m): 09.08.2001, 4 ♀♀, 4 ♂♂; Yeniköy (200 m): 10.08.2001, ♀.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Hoberlandt 1956, Lodos *et al.* 1978, Önder *et al.* 1984, Kıvan 1998, Fent & Aktaç 1999, Awad 2000, Yazıcı *et al.* 2014).

Asian Türkiye: Ağrı, Adana, Adıyaman, Afyonkarahisar, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Batman, Bayburt, Bilecik, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır,

Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hatay, Iğdır, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Kayseri, Kırşehir, Kilis, Kocaeli, Konya, Malatya, Manisa, Mardin, Muğla, Nevşehir, Niğde, Ordu, Osmaniye, Sakarya, Şanlıurfa, Tokat, Uşak, Van, Zonguldak (Puton & Noualhier 1895, Escherich 1897, Horváth 1901, 1905, Kiritshenko 1918, Gadeau de Kerville 1939, Hoberlandt 1956, Wagner 1959, Lodos *et al.* 1978, 1998, Önder *et al.* 1981, 1995, Kıyak 1990, 2000, Awad 2000, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Özgen *et al.* 2005b, ,Bolu *et al.* 2006, ,Dursun & Kartal 2008b, Demirel, 2009, Külekçi *et al.* 2009, Gözüaçık *et al.* 2011, Özgen 2012, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015 and Bulak & Yıldırım 2021 as *H. vernalis*).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, European Kazakhstan, European Türkiye, Estonia, Finland, France, Great Britain, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Sweden, Switzerland, Ukraine. North Africa: Algeria, Madeira. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NE NO WP), Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kirgizia, Mongolia, Russia (ES FE WS), Syria. Extralimital: Pakistan.

Note: The taxonomic position of these two taxa belonging to the genus *Peribalus* is still controversial by the authors. Ribes *et al.* (2006) and Ribes & Pagola-Carte (2013) consider *Peribalus vernalis* synonymous with *Peribalus strictus*. Dusoulier & Lupoli (2015) confirm the idea that these two taxa should be united under the same taxon due to the similarity of their genital structures, but they state that these two taxa differ significantly from the coloration difference in the 4th and 5th segments of the antenna and the degree of punctuation of the scutellum apex. They report that these two phenotypes are distributed in different regions except for a limited area of overlap in France, and therefore *P. vernalis* should be considered as a subspecies of *P. strictus* (Dusoulier & Lupoli 2015). These two taxa need to be reconsidered in their overlapping distribution areas.

Genus *Palomena* Mulsant & Rey

Palomena mursili Linnavuori 1984

Asian Türkiye: Mersin, Siirt (Kment & Jindra 2006, Önder *et al.* 2006, Özgen *et al.* 2018).

General Distribution: Asia: Asian Türkiye, Iran, Iraq.

Palomena prasina (Linnaeus, 1761)

Material examined: İstanbul: Sarıyer-Zekeriyaköy (0 m): 14.06.2001, ♀, ♂; Bahçeköy Bilezikçi Çiftliği (25 m): 24.06.1993, ♀, ♂; Çatalca Danamandıra (150 m): 15.08.1998, 2♀♀; Aydınlar (125 m): 28.08.1998, 2♀♀, ♂; Kırklareli: Çağlayık (620 m): 25.08.1998, ♂ ; Demirköy-Sivriler (350 m): 27.08.1998, 2 ♀♀, ♂; Lüleburgaz-Ahmetbey (100 m): 12.08.1997, ♀, ♂; Kofçaz (500 m): 02.08.2000, ♂; between İnece-Paşayeri (95 m): 02.08.2000, ♀; Pınarhisar-Mahya Hill (700 m): 07.06.2003, ♀; Mahya Hill (1030 m): 07.06.2003, 3 ♀♀; Tekirdağ: Center-Uçmakdere (300 m): 06.08.1998, ♀, ♂; Saray-Bahçeköy (190 m): 27.08.1997, 3 ♀♀, ♂; Sinanlı (105 m): 11.09.1997, 2 ♀♀, ♂; Şarköy-Ormanlı (75 m): 08.08.2001, ♂; Malkara-Sağlamtaş (170 m): 08.08.2001, ♀, 2 ♂♂; Yenidibek (210 m): 14.09.2001, ♀, ♂.

European Türkiye: Edirne, İstanbul, Kırklareli, Tekirdağ (Lodos *et al.* 1978, Fent & Aktaç 1999, Yazıcı *et al.* 2014, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bartın, Bilecik, Bolu, Burdur, Bursa, Bilecik, Çanakkale, Çankırı, Çorum, Denizli, Düzce, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hakkari, Hatay, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Karaman, Kastamonu, Kocaeli, Konya, Kütahya, Manisa, Mersin, Ordu, Osmaniye, Sakarya, Samsun, Sinop, Sivas, Şırnak, Tokat, Trabzon, Tunceli, Zonguldak (Horváth 1883, Puton 1892, Fahringer 1922, Hoberlandt 1956, Lodos *et al.* 1978, 1998, Kıyak 1993, Önder *et al.* 1995, Awad 2000, Kıyak 2000, 2016, Özgen *et al.* 2005a, Dursun & Kartal 2008b, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Fent & Japoshvili 2012, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Ireland Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Morocco. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO NW), Georgia, Iran, Kirgizia, Russia (ES WS), Syria, Tadzhikistan, Uzbekistan.

Palomena viridissima (Poda, 1761)

Material examined: Edirne: Center-Karaağaç (41 m): 12.09.2001, ♀; Lalapaşa-Doğanköy (350 m): 01.09.2001, ♂; İstanbul: Sarıyer-Zekeriyaköy (0 m): 14.06.2001, ♀, ♂; Kırklareli: Demirköy-Sivriler (350 m): 27.08.1998, ♀; Kofçaz (500 m): 02.08.2000, ♂; Lüleburgaz- Ahmetbey (100 m): 12.08.1997, ♀; Ceylanköy (70 m): 26.08.1998, ♀; Ertuğrul (230 m): 28.08.2002, ♀; Tekirdağ: Malkara-Sağlamtaş (170 m): 08.08.2001, 2 ♂♂; Şarköy-Yayaköy (230 m): 09.08.2001, ♀; Ormanlı (75 m): 08.08.2001, ♀.

European Türkiye: Tekirdağ (Kıvan 1998),

Asian Türkiye: Afyonkarahisar, Ankara, Antalya, Giresun, Hatay, İçel, İzmir, Kütahya, Manisa Mardin, Ordu, Osmaniye, Sinop (Lodos *et al.* 1978, 1998, Awad

2000, Özgen *et al.* 2005a, b, Dursun & Kartal 2008b, Dursun & Fent 2011a).

General Distribution: Europe: Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Estonia, European Türkiye, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Moldavia, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. Asia: Asian Kazakhstan, Asian Türkiye, China (NE NO SW WP), Georgia, Iran, Israel, Korea, Lebanon, Mongolia, Russia (ES FE WS), Syria. Extralimital: India, Pakistan.

Genus *Rhombocoris* Mayr

Rhombocoris regularis (Herrich-Schaeffer, 1851)

Material examined: Erzurum: Güzelyurt (2360 m): 31.07.2006, ♀.

Asian Türkiye: Adana, Ağrı, Afyonkarahisar, Amasya, Ankara, Antalya, Bayburt, Bursa, Erzurum, Gümüşhane, Kahramanmaraş, Kars, Kayseri, Van (Horváth 1883, 1901, 1905, Escherich 1897, Kiritshenko 1918, 1938, Hoberlandt 1956, Seidenstücker 1960, Lodos *et al.* 1978, 1998, Awad 2000, Önder *et al.* 2006, Külekçi *et al.* 2009).

General Distribution: Europe: Russia (ST: Dagestan). Asia: Armenia, Asian Türkiye, Azerbaijan, Iran, Syria.

Genus *Risibia* Horváth

Risibia christophi (Jakovlev, 1886)

Asian Türkiye: Diyarbakır, Erzincan, Gaziantep, Niğde, Hatay (Horváth 1903a, Kiritshenko 1918, Hoberlandt 1956, Seidenstücker 1958, Önder *et al.* 1995, 2006, Awad 2000).

General Distribution: Asia: Armenia, Asian Türkiye, Azerbaijan, Iran, Syria.

Risibia verbasci Lodos & Önder, 1980

Asian Türkiye: Bayburt, Konya (Lodos & Önder 1980, Lodos *et al.* 1998, Awad 2000, Önder *et al.* 2006, Yazıcı *et al.* 2014).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia.

Genus *Staria* Dohrn

Staria lunata (Hahn, 1835)

Material examined: Çanakkale: Eceabat-Kemalyeri (60 m): 12.08.2001, ♀; Gelibolu-Süleymaniye (50 m): 30.07.1998, ♂; Ilgardere (20 m): 08.06.2001, 2 ♀♀; Kocaçeşme (Korudağı) (350 m): 10.08.2001, 2 ♂♂; Edirne: Center-Sarayiçi (Tavukormanı) (41 m): 07.05.2002, 2 ♀♀, ♂; 12.05.2002, ♂; Enez (30 m): 30.05.1993, ♂; Keşan-Sazlıdere (10 m): 31.05.1999, ♂; Korudağı (300 m): 07.06.2001, 2 ♀♀, 2 ♂♂; Küçükyerlisu (210 m): 20.05.2003, 2 ♀♀; Lalapaşa-Hacıdanişment (500 m): 21.07.1993, ♀; Doğanköy (350 m): 01.09.2001, 2 ♂♂; Süleoğlu-Baraj (175 m): 24.05.2002, ♂; İstanbul: Gaziosmanpaşa-Boğazköy (60 m): 15.06.2011, ♀, 2 ♂♂; Bahçeköy-Bilezikçi Çiftliği (25 m): 24.06.1993, 2♂♂; Çatalca-Danamandıra (150 m): 15.08.1998, 2 ♀♀; Durusu (110 m): 29.08.1998, 3 ♂♂; Kırklareli: Center-Çağlayık (620 m): 25.08.1998, 2 ♀♀, 17.07.2001, ♀; Kızılcıkdere (200 m): 11.05.2001, ♂; Demirköy-İğneada (0 m): 25.07.2001, ♀; Balaban (Velika Deresi) (500 m): 26.05.2002, ♀; Sarpdere (300 m): 26.05.2002, ♀; Kofçaz-Erikler (430 m): 02.08.2000, ♀; Lüleburgaz-Ertuğrul (230 m): 28.08.2002, ♂; Pınarhisar-Mahya Hill (880 m): 07.06.2003, ♀, 2 ♂♂; Mahya Hill (800 m): 07.06.2003, 3 ♀♀, 2 ♂♂; Vize (200 m): 27.08.1998, 2 ♂♂; between Kıyıköy-Kömürköy (200 m): 16.06.2001, 2 ♀♀, ♂; Tekirdağ: Center-Uçmakdere (300 m): 06.08.1998, 2 ♂♂; Oruçbeyli (200 m): 07.08.2001, ♀; 18.05.2003, ♂; Nusratfakı (120 m): 09.06.2001, ♀; Işıklar (Ganos Mountains) (200 m): 18.05.2003, 2 ♂♂; Hayrabolu-Umurca (30 m): 23.05.2002, ♀; Malkara-Şahin (200 m): 29.07.1998, 2 ♀♀; Mahramlı (230 m): 30.07.1998, 3 ♀♀, 2 ♂♂; Karacahalil (210 m): 14.09.2001, ♀; 19.05.2003, 3 ♀♀, ♂; Elmalı (300 m): 19.05.2003, ♂; Saray-between Pınarca-Safaalan (100 m): 18.09.2001, ♀; Şarköy (0 m): 30.07.1998, 4 ♀♀; Yayaköy (230 m): 09.08.2001, ♂; Yeniköy (200 m): 10.08.2001, ♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Tekirdağ (Lodos *et al.* 1978, Fent & Aktaç 1999, Awad 2000, Fent 2011).

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Amasya, Ankara, Antalya, Aydın, Balıkesir, Bartın, Bilecik, Bolu, Bursa, Çanakkale, Çankırı, Çorum, Diyarbakır, Düzce, Elazığ, Erzurum, Gaziantep, Giresun, Gümüşhane, Hatay, İçel, İstanbul, İzmir, Kahramanmaraş, Kars, Kastamonu, Manisa, Mardin, Muğla, Nevşehir, Ordu, Osmaniye, Samsun, Sinop, Sivas, Şanlıurfa, Tokat, Tunceli, Zonguldak (Horváth 1883, 1901, 1919, Puton 1892, Fahringer 1922, Hoberlandt 1956, Wagner 1959, Linnavuori 1965, Lodos *et al.* 1978, 1998, Kıyak 1993, 2000, Önder *et al.* 1995, Dursun & Kartal 2008b, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Özgen & Dioli 2018, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Crete, Croatia, Czech Republic, European Türkiye, France, Germany, Greece, Hungary, Italy, Luxembourg, Macedonia, Moldavia, Montenegro, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Asian Türkiye, Azerbaijan, Georgia, Iran, Iraq, Israel, Jordan, Lebanon, Syria.

Tribe EYSARCORINI Mulsant & Rey

Genus *Eysarcoris* Hahn

Eysarcoris aeneus (Scopoli, 1763)

Material examined: Kırklareli: Center-Çağlayık (620 m): 17.07.2001, ♂, Demirköy-Sislioba (400 m):

25.07.2001, ♀, İğneada (Pedina Lake) (0 m): 26.05.2002, ♀.

European Türkiye: Edirne (Hoberlandt 1956 as *Stollia aenea* and *S. melanocephala*), Tekirdağ (Lodos *et al.* 1978).

Asian Türkiye: Adana, Bartın, Bayburt, Ordu, Samsun (Lodos *et al.* 1998, Dursun & Kartal 2008a, Fent 2010, Dursun & Fent 2011a).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Estonia, European Türkiye, Finland, France, Great Britain, Germany, Hungary, Italy, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Morocco. Asia: Asian Kazakhstan, Armenia, Asian Türkiye, Azerbaijan, China (CE NE NO), Georgia, Japan, Korea, Russia (ES FE WS). Extralimital: India.

Eysarcoris ventralis (Westwood, 1837)
=*Eysarcoris inconspicuus* (Herrich-Schaeffer, 1844)

Material examined: Edirne: Center-Değirmenyeri (120 m): 01.09.2001, ♀; Karaağaç (41 m): 21.05.2003, ♀; Lalapaşa-Doğanköy (350 m): 01.09.2001, 2 ♂♂; Sinanköy (300 m): 02.08.2000, ♀; İstanbul: Çatalca-Danamandıra (150 m): 15.08.1998, 3 ♀♀; Ormanlı (75 m): 29.08.1998, ♀; Silivri-Küçüksinekli (170 m): 25.08.1992, ♂; Büyükkılıçlı (150 m): 15.06.2001, ♀; Kırklareli: Demirköy-İğneada (0 m): 25.07.2001, ♀; Kofçaz-Erikler (430 m): 02.08.2000, 2 ♀♀; Lüleburgaz-Büyükkarıştıran, (75 m): 10.08.1997, ♀, ♂; Sarıcaali (50 m): 13.08.1997, ♀, ♂; Çağlayık (620 m): 25.08.1998, ♂, 17.07.2001, ♂; between İnece-Paşayeri (95 m): 02.08.2000, 5 ♀♀, 4 ♂♂; Vize-Kıyıköy (0 m): 26.08.1998, ♂; Tekirdağ: Malkara-between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♀; Mahramlı (230 m): 30.07.1998, ♀; Saray-Sinanlı (105 m): 11.09.1997, ♀.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Hoberlandt 1956, Lodos *et al.* 1978, Önder *et al.* 1981, 1984, Kıvan 1998, Fent & Aktaç 1999 and Özsaraç *et al.* 2001 as *E. inconspicuus*, Yazıcı *et al.* 2014).

Asian Türkiye: Ağrı, Adana, Adıyaman, Amasya, Ankara Antalya, Artvin, Aydın, Balıkesir, Bartın, Bolu, Burdur, Bursa, Çorum, Diyarbakır, Düzce, Elazığ, Erzincan, Erzurum, Gaziantep Hatay, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karaman, Kastamonu, Kocaeli, Konya Manisa, Mardin, Muğla, Muş, Nevşehir, Niğde, Ordu, Osmaniye, Rize, Sakarya, Samsun, Siirt, Sinop, Sivas, Şanlıurfa, Şırnak, Tokat, Trabzon, Uşak, Zonguldak (Horváth 1883 as *Stollia inconspicua*, Puton & Noualhier 1895 as *S. inconspicua*, Horváth 1901 as *S. inconspicua*, Fahringer 1922 as *S. inconspicua*, Kiritshenko 1918, 1924 as *S. inconspicua*, Hoberlandt 1956 as *S. inconspicua*, Wagner 1966, Lodos *et al.* 1978, 1998 as *E. inconspicuus*, Önder *et al.*1981, 1983, 1995 as *E. inconspicuus*, Kıyak 1990 as *E. inconspicuus*, Özgen *et al.* 2005b as *E. inconspicuus*, Dursun & Kartal 2008a, Karsavuran *et al.* 2008, Demirel, 2009, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013, Yazıcı *et al.* 2014, Çıtırıkkaya *et al.* 2015, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, European Türkiye France, Germany, Greece, Hungary, Italy, Malta, Macedonia, Moldavia, Montenegro, Poland, Portugal, Romania, Russia (ST) Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Azores, Canary Islands, Egypt, Libya, Madeira, Morocco, Tunisia. Asia: Afghanistan, Arab Emirates, Armenia, Asian Türkiye, Azerbaijan, China (CE NE NO NW SE SW WP), Cyprus, Georgia, Iran, Iraq, Israel, Japan, Kirgizia, Korea, Kuwait, Oman, Qatar, Saudi Arabia, Sinai, Syria, Tadzhikistan, Taiwan, Turkmenistan, Uzbekistan, Yemen. Extralimital: Tropical Africa, Cape Verde Islands, Hawaii, Oriental Region.

Genus *Stagonomus* Gorski
Stagonomus amoenus (Brullé, 1832)

Material examined: İstanbul: Gaziosmanpaşa-Boğazköy (60 m): 15.06.2011, ♂; Tekirdağ: Center-Oruçbeyli (200 m): 18.05.2003, ♀; Işıklar (Ganos Mountains) (200 m): 18.05 2003, ♀; Malkara-Izgar Village (200 m): 28.07.1998, ♀; Muratlı-Hanoğlu (60 m): 09.06.2001, 2♀♀, ♂; Kırklareli: Pınarhisar-Poyralı (310 m): 27.06.2002, ♀; Vize-Kıyıköy (0 m): 26.08.1998, ♂.

European Türkiye: Çanakkale, Edirne, Kırklareli, Tekirdağ (Lodos *et al.* 1978, Fent & Aktaç 1999).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Balıkesir, Bilecik, Bolu, Bursa, Düzce, Elazığ, Erzurum, Giresun, Hatay, Isparta, İçel, Kahramanmaraş, Karaman, Karabük, Kars, Kastamonu, Kayseri, Konya, Ordu, Osmaniye, Samsun, Sinop, Sivas, Şanlıurfa, Tokat, Trabzon, Tunceli, Zonguldak (Horváth 1883, 1905, 1919, Fahringer 1922, Hoberlandt 1956, Lodos *et al.* 1978, 1998, Kıyak 1990, Dursun & Kartal 2008a, Karsavuran *et al.* 2008, Fent 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Özgen & Dioli 2018).

General Distribution: Europe: Albania, Belgium?, Bosnia Hercegovina, Bulgaria, Crete, Croatia, Czech Republic, European Kazakhstan, European Türkiye, France, Greece, Hungary, Italy, Macedonia, Moldavia, Montenegro, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kirgizia, Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: India.

Stagonomus venustissimus (Schrank, 1776)
=*Eysarcoris fabricii* Kirkaldy, 1904
=*Eysarcoris venustissimus* (Schrank, 1776)

European Türkiye: Edirne, (Hoberlandt 1956 as *Stollia melanocephala*)

Asian Türkiye: Amasya, Bolu, Bartın, Denizli, Gümüşhane, Kastamonu, Ordu, Samsun (Lodos *et al.* 1998 as *E. fabricii*, Dursun & Kartal 2008a, Demirel, 2009 as *E. fabricii*, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Küçükbasmacı & Kıyak 2015).

General Distribution: Europe: Albania, Andorra, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, European Türkiye, France, Great Britain, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Moldavia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Armenia, Asian Türkiye, Azerbaijan, Georgia, Iran, Israel, Jordan.

Note: This species, previously known as *Eysarcoris venustissimus* under the genus *Eysarcoris*, was transferred to the genus *Stagonomus* as a result of phylogenetic and genetic studies conducted by Roca-Cusachs & Jung (2019).

Stagonomus bipunctatus bipunctatus (Linnaeus, 1758)

Material examined: Çanakkale: Eceabat-between Alçıtepe-Kabatepe (50 m): 12.08.2001, ♀; Edirne: Center-Değirmenyeni (120 m): 01.09.2001, 2♀♀; Söğütlük (41 m): 08.09.1991, ♀; Keşan-Sazlıdere (10 m): 31.05.1999, ♀; Lalapaşa-Doğanköy (350 m): 05.07.1997, 2♂♂; 01.09.2001, ♂; Süleoğlu-Baraj (175 m): 25.08.2002, 2 ♀♀, ♂; İstanbul: Bahçeköy-Bilezikçi Çiftliği (25 m): 24.06.1993, 2 ♂♂; Silivri-Beyciler (140 m): 15.08.1997, 2 ♀♀, ♂; Kırklareli: Kofçaz-Erikler (430 m): 02.08.2000, 3 ♀♀, ♂; Center-between Dereköy-Çağlayık (600 m): 28.06.2002, 2 ♂♂; Kırık (190 m): 28.08.2002, ♂; Lüleburgaz- Tozaklı (200 m): 29.08.2002, ♂; Demirköy-Balaban (700 m): 29.08.2002, ♂; Pınarhisar-Mahya Hill (840 m): 07.06.2003, ♀, ♂; Tekirdağ: Malkara-Mahramlı (230 m): 30.07.1998, ♂; Sağlamtaş (170 m): 08.08.2001, ♂; Muratlı-Hanoğlu (60 m): 09.06.2001, ♂.

European Türkiye: Edirne, İstanbul (Fent & Akataç, 2002, Yazıcı *et al.* 2014).

Asian Türkiye: Adana, Adıyaman, Amasya, Antalya, Bursa, Elazığ, Erzurum, Diyarbakır, Düzce, Gaziantep, İçel, Hatay, Kahramanmaraş, Karabük, Kastamonu, Konya, Muğla, Osmaniye, Samsun, Siirt, Sinop, Sivas, Şanlıurfa, Tokat, Trabzon (Horváth 1883, Puton 1892, Puton & Noualhier 1895, Kiritshenko 1918, Wagner 1959, Hoberlandt 1956 as *S. plataspis*, Önder *et al.* 1995, Lodos *et al.* 1998, Derjanschi & Péricart 2005, Dursun & Kartal 2008a, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Yazıcı *et al.* 2014, Özgen *et al.* 2018, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Hungary, Italy, Macedonia, Moldavia, Montenegro, Poland, Portugal, Romania, Russia (ST), Sardinia, Serbia, Sicily, Slovenia, Spain, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Afghanistan, Armenia, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Lebanon, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Stagonomus bipunctatus pusillus Herrich-Schaeffer, 1833

= *Stagonomus pusillus* (Herrich-Schaeffer, 1830)

European Türkiye: Çanakkale: Bozcaada, Edirne, İstanbul, Kırklareli (Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001 as *S. pusillus*, Fent & Aktaç, 2007b as *S. pusillus*).

Asian Türkiye: Ankara?, Karabük, Zonguldak (Lodos *et al.* 1982, 1998, and Kıyak 1993 as *S. pusillus*).

General Distribution: Europe: Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, European Türkiye, Finland, France, Germany, Greece, Hungary, Italy, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT ST), Sardinia?, Serbia, Sicily?, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine.

Note: Isakov (2000) studied the morphology of adults, larvae and eggs in a study on *Stagonomus bipunctatus* and *Stagonomus pusillus* and stated that it is difficult to distinguish these two species from each other in certain areas. Derjanschi & Péricart (2005) mistakenly perceived this work of Isakov (2000) as that these two species should be made synonymous, and Rider (2006) continued this mistake of Derjanschi & Péricart (2005). Finally, Dusoulier & Lupoli (2015) thought that it would be appropriate to reduce *S. pusillus* to the subspecies status of *S. bipunctatus*, based on the work of Isakov (2000), until further studies at the molecular level revealed the definitive situation regarding these two taxa. The status of these two taxa seems uncertain at the moment and more detailed studies are needed.

Stagonomus devius Seidenstücker, 1965

Asian Türkiye: Ankara, Elazığ, Kahramanmaraş, Tokat (Seidenstücker 1965, Lodos *et al.* 1998, Dursun & Fent 2011a, Çerçi & Özgen 2021).

General Distribution: Europe: Greece. Asia: Armenia, Asian Türkiye, Iran, Iraq, Israel, Syria, Turkmenistan.

Tribe HALYINI Amyot & Serville

Genus *Apodiphus* Spinola

Apodiphus amygdali (Germar, 1817)

Material examined: Çanakkale: Eceabat-Behramlı (100 m): 11.08.2001, 4 ♀♀, 5 ♂♂; Edirne: Center-Karaağaç (41 m): 08.09.1991, ♂; Tekirdağ: Center-Uçmakdere (300 m): 06.08.1998, ♂; Oruçbeyli (200 m): 07.08.2001, ♀.

European Türkiye: Çanakkale, Edirne, İstanbul, Tekirdağ (Fahringer 1922, Hoberlandt 1956, Lodos *et al.* 1978, Derjanschi & Péricart 2005, Fent & Aktaç 2008, Fent *et al.* 2010a).

Asian Türkiye: Adana, Adıyaman, Antalya, Artvin, Aydın, Balıkesir, Bayburt, Bingöl, Burdur, Bursa, Çorum, Denizli, Diyarbakır, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Hatay, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Kars, Kayseri, Kilis, Konya, Malatya, Manisa, Mardin, Mersin, Muğla, Osmaniye, Rize, Şanlıurfa, Tokat, Tunceli (Horváth 1883, Puton & Noualhier 1895, Kiritshenko 1918, Fahringer 1922, Hoberlandt 1956, Ghauri, 1977, Lodos *et al.* 1978, 1998, Önder & Adıgüzel, 1979, Önder *et al.* 1983, 1995, Kıyak 1990, Derjanschi & Péricart 2005, Özgen *et al.* 2005a, Bolu *et al.* 2006, Dursun & Kartal 2008a, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Fent 2010, Fent *et al.* 2010a, Şerban 2010, Tezcan *et al.* 2010, Dursun & Fent 2011a, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Kaçar & Dursun 2015, Çerçi *et al.* 2018, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Croatia, European Türkiye, Greece, Italy, Macedonia, Montenegro, Serbia. Asia: Armenia, Asian Türkiye, Azerbaijan, Georgia, Iran, Iraq, Israel, Lebanon, Syria, Turkmenistan.

Apodiphus integriceps Horváth, 1888

Asian Türkiye: Adana, Amasya, Antalya, Aydın, Diyarbakır, Isparta, İzmir, Kahramanmaraş, Konya (Fent *et al.* 2010a, Çıtırıkkaya *et al.* 2015).

General Distribution: Europe: Crete, Greece. Asia: Afghanistan, Asian Kazakhstan, Asian Türkiye, Iran, Kirgizia, Saudi Arabia, Syria, Tadzhikistan, Turkmenistan, Uzbekistan, Yemen. Extralimital: India, Pakistan.

Genus *Carenoplistus* Jakovlev

Carenoplistus acutus (Signoret, 1880)

Asian Türkiye: Adıyaman, Bitlis, Hakkari, Mardin (Önder *et al.* 1995, Kment & Jindra 2006, Fent *et al.* 2010a).

General Distribution: Asia: Afghanistan, Armenia, Asian Türkiye, Azerbaijan, Iran. Extralimital: Pakistan.

Genus *Mustha* Amyot & Serville

Mustha izmirensis Memon & Ahmad, 2008

Distribution in Türkiye: İzmir (Memon &Ahmad, 2008).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia, however, its taxonomic status is doubtful as it was described from the same type locality as *Mustha spinosula* and according to the present knowledge there is only a single species of *Mustha* occurring in western Anatolia. Genus *Mustha* need revision.

Mustha longispinis Reuter, 1890

Asian Türkiye: Amasya (Reuter 1890), Ankara? (Escherich 1897).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia, being reliably known only from its holotype.

Mustha spinosula (Lefebvre, 1831)

Material examined: Çanakkale: Eceabat-Behramlı (100 M): 11.08.2001, 2 ♀♀; Edirne: Center-Sarayiçi (Tavukormanı) (41 m): 01.06.1995, 2 ♂♂; Balkan Campus (41 m): 14.10.1995, ♀; Uzunbayır (200 m): 03.07.1997, 2 ♀♀; Enez (30 m): 21.07.1994, ♀, ♂; Keşan-Sazlıdere (10 m): 31.05.1999, ♀; Kırklareli: Pınarhisar-Poyralı (310 m): 27.06.2002, ♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Fahringer 1922, Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999, 2008, Fent *et al.* 2010a, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bayburt, Bilecik, Bingöl, Burdur, Bursa, Çanakkale, Çorum, Denizli, Diyarbakır, Elazığ, Eskişehir, Gaziantep, Giresun, Hakkari, Hatay, Iğdır, Isparta, İzmir, Kahramanmaraş, Karaman, Kastamonu, Kilis, Konya, Manisa, Mardin, Mersin, Muğla Muş, Nevşehir, Osmaniye, Ordu, Rize, Samsun, Sivas, Şanlıurfa, Tokat, Uşak (Horváth 1883, 1890, 1901, 1919, Kiritshenko 1918, 1924, Fahringer 1922, Hoberlandt 1956, Linnavuori 1965, Wagner 1966, Lodos *et al.* 1978, 1998, Kıyak 1990, 2016, Önder *et al.* 1995, Derjanschi & Péricart 2005, Özgen *et al.* 2005a, Dursun & Kartal 2008a, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Fent *et al.* 2010a, Dursun & Fent 2011a, Fent & Japoshvili 2012, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Özgen & Dioli 2018, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, European Türkiye, Greece, Macedonia, Montenegro, Russia (ST: Caucasus). North Africa: Egypt. Asia: Armenia, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Syria, Turkmenistan.

Mustha vicina Hoberlandt, 1997

Asian Türkiye: Gaziantep (Önder *et al.* 1995a as *M. incana* and *M. longispinis*, Fent *et al.* 2010a), Şanlıurfa (Özgen *et al.* 2005a as *M. longispinis*), Diyarbakır, Elazığ, Mardin (Bolu *et al.* 2006 as *M. longispinis*), Adıyaman, Diyarbakır, Şanlıurfa (Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014).

General Distribution: Asia: Asian Türkiye, Iran.

Tribe MECIDEINI Distant

Genus *Mecidea* Dallas

Mecidea lindbergi Wagner, 1954

Asian Türkiye: Siirt (Özgen & Çerçi, 2018).

General Distribution: Europe: Crete, France, Great Britain (migrant), Greece, Italy, Romania. North Africa: Algeria, Canary Islands, Egypt?, Morocco, Tunisia. Asia: Afghanistan, Asian Türkiye, Iran, Iraq, Israel, Jordan, Saudi Arabia, Sinai, Syria, Turkmenistan, Yemen. Extralimital: Burkina Fasso, Cape Verde Is.

Tribe PENTATOMINI Leach
Genus *Acrosternum* Fieber
Acrosternum breviceps (Jakovlev, 1889)

Asian Türkiye: Adıyaman, Diyarbakır, Mersin, Şanlıurfa (Önder *et al.* 1995, 2006, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014).

General Distribution: Asia: Afghanistan, Armenia, Asian Türkiye, Azerbaijan, Georgia, Iran, Iraq, Kirgizia, Kuwait, Saudi Arabia, Tadzhikistan, Turkmenistan, Uzbekistan.

Acrosternum heegeri Fieber, 1861

European Türkiye: Edirne (Fent & Aktaç 2007b).

Asian Türkiye: Adana, Adıyaman, Antalya, Ardahan, Artvin, Bursa, Diyarbakır, Erzurum, Gaziantep, Hatay, Iğdır, Isparta, İçel, İstanbul, İzmir, Manisa, Mardin, Mersin, Muğla, Kahramanmaraş, Kayseri, Kilis, Osmaniye, Sinop, Şanlıurfa, Trabzon (Lodos *et al.* 1978, 1998, Önder & Adıgüzel 1979, Önder *et al.* 1981, 1983, 1995, 2006, Özgen *et al.* 2005a, b, Dursun & Kartal 2008c, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Tezcan *et al.* 2010, 2013, Gözüaçık *et al.* 2011, Yazıcı *et al.* 2014, Çıtırıkkaya *et al.* 2015, Kaçar & Dursun 2015, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Hungary, Italy, Macedonia, Montenegro, Portugal, Russia (ST: Caucasus) Slovenia, Spain, Ukraine. North Africa: Algeria, Canary Islands, Egypt, Libya, Madeira, Morocco, Tunisia. Asia: Afghanistan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Sinai, Syria, Yemen. Extralimital: Pakistan, tropical Africa.

Acrosternum millierei (Mulsant & Rey, 1866)

Material examined: Çanakkale: Eceabat-Behramlı (100 m): 11.08.2001, ♀, ♂; Tekirdağ: Center-Işıklar (Ganos Dağı) (210 m): 24.08.2000, ♂.

European Türkiye: Edirne (Önder *et al.* 1984).

Asian Türkiye: Adana, Adapazarı, Adıyaman, Antalya, Aydın, Bayburt, Bursa, Çorum, Diyarbakır, Gaziantep, Hatay, İçel, İzmir, Kahramanmaraş, Kilis, Kocaeli, Mersin, Muğla, Osmaniye, Sinop, Şanlıurfa (Linnavuori 1954, 1965, Hoberlandt 1956, Lodos *et al.* 1978, 1998, Önder & Adıgüzel 1979, Önder *et al.* 1981, 1995, Özgen *et al.* 2005a, Dursun & Kartal 2008c, Tezcan *et al.* 2010, 2013, Gözüaçık *et al.* 2011, Yazıcı *et al.* 2014, Kaçar & Dursun 2015).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Hungary, Italy, Malta, Montenegro, Portugal, Romania, Slovenia, Spain, Yugoslavia. North Africa: Algeria, Canary Islands, Egypt, Libya, Madeira, Morocco, Tunisia. Asia: Afghanistan, Asian Türkiye, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Saudi Arabia, Sinai, Syria, Yemen. Extralimital: tropical Africa.

Genus *Nezara* Amyot & Serville
Nezara viridula (Linnaeus, 1758)

Material examined: Çanakkale: Gelibolu-Fındıklı (105 m): 07.06.2001, ♂; Edirne: Center-Selimeye Öğrenci Yurdu (41 m): 30.10.1995, ♂; 11.12.1995, ♀; Değirmenyeri (120 m): 01.09.2001, 3 ♀♀, 2 ♂♂; Lalapaşa-Sinanköy (300 m): 02.08.2000, ♀; Doğanköy (350 m): 01.09.2001, ♂; İstanbul: Center-Bakırköy (100 m): 20.11. 1994, ♀; Çatalca-Ormanlı (75 m): 29.08.1998, ♂; Kırklareli: Demirköy-Sislioba (400 m): 25.07.2001, ♀, ♂; Pınarhisar-Mahya Hill (880 m): 07.06.2003, ♀; Vize-Kıyıköy (0 m): 16.06.2001, ♀; Tekirdağ: Center-Naipköy (30 m): 13.05.1996, 3 ♀♀, ♂; Oruçbeyli (200 m): 07.08.2001, ♀; Malkara-Izgar Village (200 m): 03.08.1997, ♀; 05.05.2001, 2 ♂♂; Sağlamtaş (170 m): 08.08.2001, ♀; Yenidibek (210 m): 14.09.2001, ♀; Şarköy-Yayköy (230 m): 09.08.2001, ♂.

European Türkiye: İstanbul, Tekirdağ (Fahringer 1922, Schmitschek, 1944, Kıvan 1998, Yazıcı *et al.* 2014, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adıyaman, Amasya, Ankara, Antalya, Aydın, Balıkesir, Bayburt, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Düzce, Erzurum, Gaziantep, Giresun, Hatay, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Kars, Kastamonu, Kocaeli, Malatya, Manisa, Mersin, Muğla, Ordu, Osmaniye, Rize, Sakarya, Samsun, Sinop, Tokat, Trabzon, Tunceli, Zonguldak (Puton 1892, Hoberlandt 1956, Wagner 1966, Lodos *et al.* 1978, 1998, Önder *et al.* 1981, 1983, 1995, Kıyak 1993, Özsaraç *et al.* 2001, Dursun & Kartal 2008c, Külekçi *et al.* 2009, Şerban 2010, Tezcan *et al.* 2010, 2013, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Bulak & Yıldırım 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Crete, Croatia, Czech Republic, European Türkiye, France, Great Britain, Germany, Greece, Hungary, Italy, Macedonia, Malta, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (ST: Caucasus), Serbia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Azores, Canary Islands, Egypt, Libya, Madeira, Morocco, Tunisia. Asia: Afghanistan, Asian Türkiye, Azerbaijan, China (CE NO SE SW WP), Cyprus, Georgia, Iran, Iraq, Israel, Japan, Jordan, Korea, Kuwait, Lebanon, Quatar, Saudi Arabia, Syria, Taiwan Yemen. Extralimital: tropical and subtropical, Cosmopolitan.

Genus *Pentatoma* Olivier
Subgenus *Pentatoma* Olivier
Pentatoma rufipes (Linnaeus, 1758)

Material examined: Çorum: Kargı-Abidin Plateau (1700m): 19.09.2020, ♂; Kırklareli: Ahmetler (570 m):17.07.2001, ♀; Demirköy-Sislioba (400 m): 25.07.2001, ♀, ♂; between Yeşilce-Avcılar (350 m): 25.07.2001, ♀; Pınarhisar-Mahya Hill (880 m): 7.06.2003, ♂.

First record for the Thrace Region.

Asian Türkiye: Bolu, İstanbul, Kocaeli (Fahringer 1922, Hoberlandt 1956, Fent 2010).

General Distribution: Europe: Albania, Andorra, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, Finland, France, Great Britain, Germany, Greece, Hungary, Ireland Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Morocco. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NE NO NW SW WP), Iran, Georgia, Japan, Korea, Mongolia, Russia (ES FE WS). Extralimital: India.

Genus *Rhaphigaster* Laporte

Rhaphigaster nebulosa (Poda, 1761)

Material examined: Çanakkale: Eceabat-Behramlı (100 m): 11.08.2001, 3♀♀, 5♂♂; Kemalyeri (60 m): 12.08.2001, 2 ♀♀, 3 ♂♂; Gelibolu-Süleymaniye (50 m): 30.07.1998, ♀, 2 ♂♂; Fındıklı (105 m): 07.06.2001, 2 ♀♀; Ilgardere (20 m): 08.06.2001, 2♀♀, ♂; Edirne: Center (41m): 10.04.1995, 2 ♀♀; Söğütlük (41m): 12.09.2001, 3 ♀♀; Sarayiçi (Tavukormanı) (41 m): 21.05.2002, ♀; Balkan Campus (41 m): 06.06.2002, 2 ♀♀; İstanbul: Büyükçekmece-Tepecik (20 m): 28.08.1998, ♀, 3 ♂♂; Babanakkaş (70 m): 29.08.1998, 2 ♀♀, 2 ♂♂; Çatalca-Aydınlar (125 m): 28.08.1998, ♀; Durusu (110 m): 29.08.1998, ♀; Binkılıç (125 m): 18.09.2001, ♂; Oklalı (60 m): 14.06.2001, ♀; Kırklareli: Center (200 m): 17.07.2000, 2 ♂♂; Demirköy-İğneada (0 m): 25.07.2001, ♀; Lüleburgaz-Büyükkarıştıran, (75 m): 10.08.1997, ♀; Ceylanköy (70 m): 26.08.1998, ♀, ♂; Ertuğrul (230 m): 26.08.2002, ♂; Tozaklı (200 m): 29.08.2002, 3 ♀♀, ♂; Tekirdağ: Center-Uçmakdere (300 m): 06.08.1998, ♀, ♂; Hayrabolu-Dambaslar (110 m): 16.08.1997, ♀; Malkara-Mahramlı (230 m): 30.07.1998, ♂; 07.08.2001, 3 ♀♀, ♂; Sağlamtaş (170 m): 08.08.2001, ♀, ♂; Elmalı (220 m) 14.09.2001, ♀, 3 ♂♂; Yenidibek (210 m): 14.09.2001, ♀, ♂; Saray-Sinanlı (105 m): 11.09.1997, ♀; Şarköy-Ulaman (100 m): 09.08.2001, ♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Tekirdağ (Horváth 1918, Kıvan 1998, Fent & Aktaç 1999, 2008, Yazıcı *et al.* 2014, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Ağrı, Aksaray, Ankara, Antalya, Artvin, Aydın, Bartın, Bingöl, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Erzincan, Erzurum, Gaziantep, Gümüşhane, Hatay, Hakkari, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karaman, Kastamonu, Kayseri, Kırklareli, Kilis, Kocaeli, Konya, Kütahya, Malatya, Manisa, Mardin, Muğla, Nevşehir, Niğde, Ordu, Sakarya, Samsun, Sinop, Şanlıurfa, Tokat, Trabzon, Uşak, Yozgat, Zonguldak (Horváth 1883, Escherich 1897, Kiritshenko 1918, Gadeau de Kerville 1939, Lodos *et al.* 1978, 1998, Önder *et al.* 1981, 1983, 1995, Özsaraç *et al.* 2001, Özgen *et al.* 2005a, Dursun & Kartal 2008c, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Fent 2010, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Çıtırıkkaya *et al.* 2015, Kıyak 2016, Küçükbasmacı & Kıyak 2015, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, European Türkiye, France, Germany, Great Britain, Greece, Hungary, Italy, Luxembourg, Malta, Macedonia, Moldavia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Morocco. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Syria, Turkmenistan, Uzbekistan. Extralimital: Pakistan.

Tribe PIEZODORINI Atkinson

Genus *Pausias* Jakovlev

Subgenus *Pausias* Jakovlev

Pausias martini (Puton, 1890)

Material examined: Çorum: İskilip-Pazar Seyirtepe (750 m): 11.07.2020, ♂; Kahramanmaraş: Afşin (1230 m): 21.09.2008, 3 ♀♀, 2 ♂♂.

European Türkiye: Edirne (Dursun & Fent 2015).

Asian Türkiye: Amasya, Ankara, Burdur, Çanakkale, Diyarbakır, Elazığ, Erzincan, Iğdır, İzmir, Karaman, Konya, Tokat (Wagner 1959, Lodos 1963, Lodos *et al.* 1978, 1998, Önder *et al.* 1983, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Bolu *et al.* 2006, Önder *et al.* 2006, Dursun & Kartal 2008c, Gözüaçık *et al.* 2011, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021).

General Distribution: Europe: European Türkiye. Asia: Armenia, Asian Türkiye, Azerbaijan, Iran, Iraq, Syria.

Genus *Piezodorus* Fieber

Piezodorus lituratus (Fabricius, 1794)

Material examined: Çanakkale: Eceabat-Behramlı (100 m): 11.08.2001, 2♀♀, 5♂♂; Edirne: Keşan-Sazlıdere (10 m): 31.05.1999, ♂; İstanbul: Silivri-Beyciler (140 m): 15.08.1997, ♀, ♂; Kırklareli: Center-Çağlayık (620 m): 25.08.1998, ♀; Kofçaz (500 m): 02.08.2000, ♂; Pınarhisar-Mahya Hill (800 m): 07.06.2003, ♂; Vize-between Kıyıköy-Kömürköy (200 m): 16.06.2001, ♂; Tekirdağ: Center-Köseilyas (50 m): 02.08.1998, ♀; Nusratfakı (120 m): 09.06.2001, ♀; Hayrabolu-Umurca (30 m): 23.05.2002, ♂; Malkara-Izgar Village (200 m): 28.07.1998, ♀; Mahramlı (Cumhuriyet Ormanı) (230 m): 07.08.2001, ♂; Elmalı (220 m): 14.09.2001, ♀; Şarköy-Emirali (200 m): 30.07.1998, ♀, 6 ♂♂; Emirali-Çınarlıdere (210 m): 31.05.1999, ♀, 2 ♂♂.

European Türkiye: Çanakkale Edirne, İstanbul, Tekirdağ (Fahringer 1922, Lodos *et al.* 1978, Kıvan 1998, Fent & Aktaç 1999, Fent 2011).

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Amasya, Antalya, Ankara, Ardahan, Artvin, Aydın, Balıkesir, Bayburt, Bilecik, Bingöl, Bolu, Burdur, Bursa Çanakkale, Çankırı, Çorum, Diyarbakır, Elazığ, Erzurum, Eskişehir, Gaziantep, Hatay, Iğdır, Isparta, İçel, İzmir, Kahramanmaraş, Karabük, Kars, Kastamonu, Kırklareli, Kütahya, Malatya, Manisa, Mardin, Mersin, Muğla, Nevşehir, Ordu, Samsun, Sinop, Şanlıurfa, Şırnak, Tokat, Trabzon, Zonguldak (Horváth 1883, 1891,1901, Puton 1892, Kiritshenko 1918, 1924, Linnavuori, 1954, Hoberlandt 1956, Wagner 1959, Lodos *et al.* 1978, 1998, Önder *et al.* 1981, 1983, 1995, Kıyak 1990, 1993, 2000, Özsaraç *et al.* 2001, Özgen *et al.* 2005a, b, Bolu *et al.* 2006, Dursun & Kartal 2008c, Külekçi *et al.* 2009, Fent 2010, Gözüaçık *et al.* 2011, Fent & Japoshvili 2012, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çıtırıkkaya *et al.* 2015, Özgen & Dioli 2018, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, European Türkiye, France, Great Britain, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Azores, Morocco, Madeira, Tunisia. Asia: Asian Kazakhstan, Armenia, Asian Türkiye, Azerbaijan, China (NW), Cyprus, Georgia, Iran, Iraq, Israel, Kirgizia, Lebanon, Russia (ES WS), Syria.

Tribe SCIOCORINI Amyot & Serville
Genus *Dyroderes* Spinola
Dyroderes umbraculatus (Fabricius, 1775)

Material examined: Edirne: Center-Sarayiçi (Tavukormanı) (41 m): 07.05.2002, ♂; 12.05.2002, 2 ♀♀, ♂; 21.05.2002, 11 ♀♀, 7 ♂♂; 06.06.2002, 3 ♀♀, 2 ♂♂; Karaağaç (41 m): 21.05.2003, ♂; Lalapaşa-Doğanköy (350 m) 01.09.2001, ♂; Kırklareli: Çukurpınar (500 m): 25.08.1998, ♀; Tekirdağ: Saray-Sinanlı (105 m): 11.09.1997, ♂; Malkara-Mahramlı (Cumhuriyet Ormanı) (230 m): 07.08.2001, ♀; Elmalı (300 m): 19.05.2003, ♂.

European Türkiye: Edirne, Kırklareli, Tekirdağ, (Lodos *et al.* 1978, Lodos & Önder 1982, Fent & Aktaç 1999).

Asian Türkiye: Adana, Adıyaman, Afyonkarahisar, Aksaray, Antalya, Amasya, Ankara, Balıkesir, Bartın, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çorum, Denizli, Elazığ, Gaziantep, Hatay, İstanbul, İzmir, Kahramanmaraş, Karabük, Karaman, Konya, Kütahya, Manisa, Mardin, Muğla, Nevşehir, Niğde, Ordu, Osmaniye, Sinop, Tokat, Trabzon, Yalova, Zonguldak (Horváth 1883, Puton 1892, Escherich 1897, Hoberlandt 1956, Lodos *et al.* 1978, 1998, Lodos & Önder 1982, Önder *et al.* 1995, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Dursun & Kartal 2008a, Fent 2010, Dursun & Fent 2011b, Gözüaçık *et al.* 2011, Matocq *et al.* 2014).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Croatia, Czech Republic, European Türkiye, France, Germany, Great Britain, Greece, Hungary, Italy, Macedonia, Moldavia, Montenegro, Netherlands, Portugal, Romania, Russia (ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Egypt, Morocco, Tunisia. Asia: Armenia, Asian Türkiye, Azerbaijan, Cyprus, Iran, Iraq, Israel, Jordan, Syria.

Genus *Menaccarus* Amyot & Serville
Subgenus *Oploscelis* Mulsant & Rey
Menaccarus arenicola (Scholtz, 1847)

Asian Türkiye: Ankara, Gümüşhane, İzmir (Hoberlandt 1956, Lodos & Önder 1982, Önder *et al.* 2006, Dursun & Fent 2011b).

General Distribution: Europe: Austria, Bulgaria, Belarus, Czech Republic, European Kazakhstan, France, Great Britain, Germany, Hungary, Italy, Macedonia, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Spain, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Asian Kazakhstan, Asian Türkiye, Iran, Israel?, Kirgizia, Russia (WS), Syria, Turkmenistan.

Genus *Phaeocoris* Jakovlev
Phaeocoris ellipticus ellipticus (Herrich-Schaeffer, 1840)
= *Lodosia gonocoxa* Ahmad & Önder, 1996

Asian Türkiye: Erzincan (Ahmad *et al.* 1996 as *Lodosia gonocoxa*).

General Distribution: Asia: Asain Kazakhstan, Asian Türkiye, China (NW WP), Kirgizia, Mongolia, Russia (ES WS).

Genus *Sciocoris* Fallén
Subgenus *Aposciocoris* Wagner
Sciocoris atifi Lodos & Önder 1982

Asian Türkiye: Gaziantep, Hatay, Kahramanmaraş, Kilis, Siirt (Lodos & Önder 1982, Lodos *et al.* 1998, Önder *et al.* 1995, 2006).

General Distribution: Asia: Asian Türkiye, Iran.

Sciocoris homalonotus Fieber, 1851

European Türkiye: Edirne, Tekirdağ (Fent & Aktaç 2007b).

Asian Türkiye: Ankara, Isparta, İzmir, Kastamonu, Kayseri, Kırşehir, Mardin (Lodos & Önder 1982, Kıyak 1993, Önder *et al.* 1995, 2006, Lodos *et al.* 1998, Fent 2010, Fent & Japoshvili 2012)

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Croatia, Czech Republic, Denmark, European Türkiye, Finland, France, Germany, Great Britain, Hungary, Italy, Macedonia, Moldavia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Armenia, Asian

Türkiye, Azerbaijan, Georgia, Israel, Iran, Lebanon, Syria.

Sciocoris luteolus Fieber, 1861

Material examined: İstanbul: Silivri- Çantaköy (50 m): 28.08.1998, ♀; Tekirdağ: Malkara- between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♀; Şarköy (0 m): 30.07.1998, ♀.

European Türkiye: Thrace (Fieber, 1861), Edirne, Tekirdağ (Fent & Aktaç 1999).

Asian Türkiye: Adana, Adıyaman, Amasya, Ankara, Antalya, Bolu, Diyarbakır, Elazığ, Gaziantep, Giresun, Hatay, İçel, Kahramanmaraş, Kastamonu, Kayseri, Kırşehir, Mardin, Mersin, Nevşehir, Siirt, Sivas, Şanlıurfa, Tokat (Horváth 1901, 1919, Fahringer 1922, Hoberlandt 1956, Lodos & Önder 1982, Önder *et al.* 1995, Lodos *et al.* 1998, Kıyak *et al.* 2004, Derjanschi & Péricart 2005, Fent 2010, Dursun & Fent 2011b, Gözüaçık *et al.* 2011, Matocq *et al.* 2014).

General Distribution: Europe: European Türkiye, Italy, Macedonia, Spain. North Africa: Tunisia. Asia: Afghanistan, Asian Türkiye, Iran, Israel, Jordan, Syria.

Sciocoris macrocephalus Fieber, 1851

Material examined: Çanakkale: Eceabat-between Alçıtepe-Kabatepe (Türk Şehitliği) (50 m): 12.08.2001, ♀; Gelibolu-Ilgardere (20 m): 11.08.2001 2 ♀♀; İstanbul: Büyükçekmece-Tepecik (20 m): 28.08.1998, 8 ♀♀, 2 ♂♂; Çatalca-Danamandıra (150 m): 15.08.1998, 2 ♀♀, 2 ♂♂; Kabakça (100 m): 28.08.1998, ♀, 7 ♂♂; Babanakkaş (70 m): 29.08.1998, ♂; Silivri (50 m): 25.08.1992, 3 ♀♀, 2 ♂♂; Çantaköy (50 m): 28.08.1998, 4 ♀♀, 2 ♂♂; Kırklareli: Center-Kuzucu (300 m) 25.08.1998, 2 ♀♀; Ceylanköy (70 m): 26.08.1998, 3 ♀♀; Tekirdağ: Hayrabolu-Dambaslar (110 m): 16.08.1997, 2 ♀♀, ♂; Malkara-Hasköy (250 m): 26.09.1992, ♂; Danişment (Korudağı) (250 m): 15.09.2001, ♂; Saray (180 m): 16.06.2001, ♂; Aydınlar (125 m): 28.08.1998, ♀; Şarköy (0 m): 30.07.1998, ♀, ♂♂; Şahin (200 m): 29.07.1998, 3 ♀♀.

European Türkiye: Çanakkale, Edirne, İstanbul, Tekirdağ (Fahringer 1922, Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999, Derjanschi & Péricart 2005, Fent 2011).

Asian Türkiye: Adıyaman, Ankara, Antalya, Balıkesir, Bayburt, Bilecik, Burdur, Bursa, Çanakkale, Diyarbakır, Elazığ, Erzurum, Gaziantep, Gümüşhane, Isparta, İçel, İzmir, Kahramanmaraş, Kars, Kayseri, Kütahya, Mardin, Muğla, Nevşehir, Niğde, Siirt, Sinop, Sivas, Van (Horváth l883, 1905, Punton, 1892, Kiritshenko 1918, Linnavuori 1954, Hoberlandt 1956, Tuatay *et al.* 1972, Lodos *et al.* 1978, 1998, Lodos & Önder 1982, Önder *et al.* 1995, Dursun & Kartal 2008a, Şerban 2010, Dursun & Fent 2011b, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Belgium?, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, France, Germany, Greece, Hungary, Italy, Luxembourg, Macedonia, Moldavia, Montenegro, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Cyprus, Georgia, Iran, Israel, Jordan, Kirgizia, Mongolia, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Sciocoris microphthalmus Flor, 1860

Asian Türkiye: Adana, Hatay, Kahramanmaraş, Kütahya, Ordu, Samsun, Tokat (Lodos & Önder 1982, Lodos *et al.* 1998, Dursun & Kartal 2008a, Önder *et al.* 2006).

General Distribution: Europe: Albania, Andorra Austria, Belgium?, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Moldavia, Montenegro, Norway, Poland, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NE NO WP), Georgia, Iran, Mongolia, Russia (ES FE WS). Extralimital: Canada, United States.

Sciocoris pictus Wagner 1959

Asian Türkiye: Adana, Batman, Diyarbakır, Gaziantep, İçel, Kahramanmaraş, Mardin, Osmaniye, Siirt (Wagner 1959, Lodos & Önder 1982, Önder *et al.* 1995, 2006, Lodos *et al.* 1998, Özgen *et al.* 2005a).

General Distribution: Europe: Greece. Asia: Asian Türkiye, Iran.

Sciocoris umbrinus (Wolff, 1804)

Asian Türkiye: Adana, İzmir (Hoberlandt 1956, Lodos & Önder 1982, Önder *et al.* 2006).

General Distribution: Europe: Austria, Bulgaria, Belarus, Czech Republic, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Moldavia, Norway, Poland, Portugal, Romania, Russia (CT NT), Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria. Asia: Asian Kazakhstan, Asian Türkiye, China (NO), Iran, Israel, Mongolia, Russia (ES WS), Syria.

Subgenus *Neosciocoris* Wagner

Sciocoris maculatus Fieber, 1851

European Türkiye: Çanakkale (Lodos *et al.* 1978).

Asian Türkiye: Ankara, Antalya, Çankırı, Diyarbakır, Hatay, İzmir, Kayseri, Kırşehir, Muğla, Samsun, Şanlıurfa (Hoberlandt 1956, Lodos & Önder 1982, Lodos *et al.* 1978, 1998, Özgen *et al.* 2005b, Dursun & Kartal 2008a, Önder *et al.* 2006, Gözüaçık *et al.* 2011).

General Distribution: Europe: Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Italy, Malta, Macedonia, Portugal?, Russia (ST: Dagestan), Serbia,

Slovenia?, Spain. North Africa: Algeria, Canary Islands, Morocco, Madeira, Tunisia. Asia: Armenia, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Israel, Jordan, Syria.

Sciocoris orientalis Linnavuori 1960

Asian Türkiye: Antalya (Derjanschi & Péricart 2005).

General Distribution: Asia: Asian Türkiye, Cyprus, Iran, Israel, Saudi Arabia, Syria, Yemen. Extralimital: tropical Africa.

Sciocoris pallens Klug, 1845

Asian Türkiye: Antalya, Gaziantep, Hatay, İçel, Kahramanmaraş (Seidenstücker 1960, Önder *et al.* 1995, Lodos *et al.* 1998), Elazığ (Önder *et al.* 2006 as *S. fissus*).

General Distribution: Europe: France, Italy, Malta?, Portugal?, Spain. North Africa: Algeria, Canary Islands, Egypt, Morocco, Tunisia. Asia: Asian Türkiye, Iran, Israel, Syria.

Sciocoris persimilis Wagner, 1965

Asian Türkiye: Ankara (Wagner 1965, Lodos & Önder, 1982, Derjanschi & Péricart 2005).

General Distribution: Asia: Asian Türkiye.

This species is endemic to Anatolia.

Subgenus *Parasciocoris* Wagner
Sciocoris capitatus Jakovlev, 1882

Asian Türkiye: Adıyaman, Bolu, Diyarbakır, Kahramanmaraş, Kastamonu, Konya, Mardin, Niğde, Şanlıurfa (Lodos & Önder 1982, Lodos *et al.* 1998, Önder *et al.* 1995, 2006, Gözüaçık *et al.* 2011).

General Distribution: Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Georgia, Iran, Iraq, Kirgizia, Tadzhikistan, Turkmenistan, Uzbekistan.

Sciocoris convexiusculus Puton, 1874

Asian Türkiye: Adana, Hatay, İçel, Kahramanmaraş (Seidenstücker 1958 as *S. sahlbergi*, Linnavuori 1965, Lodos & Önder 1982, Lodos *et al.* 1998 as *S. sahlbergi*, Önder *et al.* 2006 as *S. sahlbergi*).

General Distribution: Europe: Greece (Lesbos). North Africa: Algeria, Egypt, Libya, Morocco. Asia: Afghanistan, Asian Türkiye, Iran, Iraq, Israel, Jordan, Lebanon, Saudi Arabia, Sinai, Syria, Yemen. Extralimital: Sudan.

Subgenus *Sciocoris* Fallén
Sciocoris cursitans cursitans (Fabricius, 1794)

Material examined: Edirne: Keşan-Küçükyerlisu (210 m): 20.05.2003, ♀; Kırklareli: Kofçaz- Ahmetler (570 m): 29.06.2002, ♀; Tekirdağ: Hayrabolu-Dambaslar (110 m): 16.08.1997, ♀, ♂; Hedeyli (150 m): 23.05.2002, 5 ♀♀, 2 ♂♂; Malkara-Kozyörük (250 m): 19.05.2002, 2 ♀♀.

European Türkiye: Edirne (Hoberlandt 1956).

Asian Türkiye: Bayburt, Bilecik, Bolu, Bursa, Diyarbakır, Düzce, Elazığ, Erzincan, Erzurum, Hatay, Isparta, İzmir, Kars, Kastamonu, Kayseri, Kütahya, Manisa, Muğla, Şanlıurfa (Horváth 1883, Hoberlandt 1956, Linnavuori 1965, Lodos *et al.* 1978, 1998, Lodos & Önder 1982, Kıyak 1990, Önder *et al.* 1995, Fent 2010, Gözüaçık *et al.* 2011, Fent & Japoshvili 2012, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Morocco. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Russia (ES WS), Syria. Extralimital: Pakistan.

Sciocoris deltocephalus Fieber, 1861

Material examined. Çanakkale: Alçıtepe-between Kabatepe (Türk Şehitliği) (50 m): 12.08.2001, 2 ♀♀.

European Türkiye: Edirne (Hoberlandt 1956, Lodos *et al.* 1978, Lodos & Önder 1982).

Asian Türkiye: Ankara, Balıkesir, Diyarbakır, Erzincan, Isparta, İzmir, Kastamonu, Mardin, Muğla, Niğde, Van (Kiritshenko 1924, Tuatay *et al.* 1972, Lodos *et al.* 1978, Lodos & Önder 1982, Önder *et al.* 1995, Derjanschi & Péricart 2005, Fent 2010, Matocq *et al.* 2014).

General Distribution: Europe: Bulgaria, Crete, Croatia, Czech Republic, European Türkiye, Greece, Hungary, Macedonia, Moldavia, Romania, Russia (ST), Serbia, Ukraine. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Georgia, Iran, Kirgizia, Lebanon, Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Pakistan.

Sciocoris distinctus Fieber, 1851

European Türkiye: Edirne (Hoberlandt 1956).

Asian Türkiye: Ankara, Erzincan, Erzurum, Kars, Mardin, Nevşehir, Ordu, Tokat (Kiritshenko 1918, Hoberlandt 1956, Lodos & Önder 1982, Kıyak 2000, Önder *et al.* 2006, Dursun & Fent 2011b, Özgen 2012, Yazıcı *et al.* 2014).

General Distribution: Europe: Austria, Bulgaria, Belarus, Croatia, Czech Republic, European Türkiye, Germany, Hungary, Italy, Kazakhstan, Moldavia, Poland, Romania, Russia (CT ST) Serbia, Slovakia, Slovenia?, Spain, Switzerland, Ukraine. North Africa: Algeria. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO) Israel, Kirgizia, Lebanon, Mongolia, Russia (ES FE WS), Syria, Tadzhikistan, Uzbekistan.

Sciocoris helferii Fieber, 1851

European Türkiye: Kırklareli (Lodos & Önder 1982).

Asian Türkiye: Adana, Ankara, Denizli, Diyarbakır, Elazığ, İstanbul, İzmir, Kars, Kayseri, Kırşehir, Muğla, Şanlıurfa, Van (Kiritshenko 1918, Hoberlandt 1956, Linnavuori 1965, Lodos *et al.* 1978, 1998, Lodos & Önder 1982, Kıyak 1993, Derjanschi & Péricart 2005, Önder *et al.* 2006, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013).

General Distribution: EU: Europe: Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Italy, Malta, Macedonia, Portugal, Romania?, Spain. North Africa: Algeria, Canary Islands, Egypt, Libya, Morocco, Madeira, Tunisia. Asia: Afghanistan, Asian Türkiye, Cyprus, Iran, Iraq, Israel, Lebanon, Syria. Extralimital: Pakistan.

Sciocoris hoberlandti Wagner, 1954

Asian Türkiye: Aydın, Diyarbakır, İzmir, Kahramanmaraş, Ordu, Şanlıurfa (Seidenstücker 1957, Lodos *et al.* 1978, Lodos & Önder 1982, Önder *et al.* 2006, Dursun & Kartal 2008a, Gözüaçık *et al.* 2011).

General Distribution: Asia: Asian Türkiye, Cyprus, Iran, Israel, Jordan, Lebanon, Syria.

Sciocoris ochraceus Fieber, 1861

Asian Türkiye: Adana, Antalya, Burdur, Diyarbakır, Elazığ, Hatay, İçel, İzmir, Kahramanmaraş, Mardin, Mersin, Muğla, Osmaniye, Siirt, Şırnak, Tokat, Van (Seidenstücker 1958, Wagner 1959, 1966, Lodos *et al.* 1978, 1998, Kıyak 1990, Önder *et al.* 1995, 2006, Derjanschi & Péricart 2005, Dursun & Fent 2011b, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014).

Türkiye (Fieber, 1861) without locality.

General Distribution: Europe: Greece. North Africa: Tunisia. Asia: Asian Türkiye, Cyprus, Iran, Iraq, Israel, Jordan, Syria.

Sciocoris ogivus Jakovlev, 1894

Asian Türkiye: Bayburt, Erzurum (Yazıcı *et al.* 2014).

General Distribution: Europe: Russia (ST: Caucasus). Asia: Armenia, Asian Türkiye, Azerbaijan, Georgia, Iran.

Sciocoris ressli Wagner, 1966

Asian Türkiye: Afyonkarahisar, Diyarbakır, Gaziantep, Kayseri, Şanlıurfa (Wagner 1966, Önder *et al.* 1995, 2006, Lodos *et al.* 1998).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia.

Sciocoris sulcatus Fieber, 1851

Material examined: Çanakkale: Gelibolu-Güneyli (50 m): 31.05.1999, ♀; Gelibolu- Kocaçeşme (Korudağı) (350 m): 20.05.2003, ♀, ♂; Edirne: Keşan (Koru Dağı) (350 m): 07.06.2001, 2 ♀♀, ♂; Lalapaşa-Doğanköy (350 m): 05.07.1997, ♀; Kırklareli: Center-Dereköy (300 m): 28.06.2002, ♀; Çağlayık (620 m): 28.06.2002, 6 ♀♀, 2 ♂♂; Kofçaz-Beyci (350 m): 17.07.2001, ♀; Ahmetler (570 m): 29.06.2002, 5 ♀♀, ♂; Tekirdağ: Muratlı-Hanoğlu (60 m): 09.06.2001, ♂.

European Türkiye: Kırklareli (Lodos & Önder 1982).

Asian Türkiye: Adana, Adıyaman, Ankara, Batman, Bingöl, Bursa, Denizli, Diyarbakır, Elazığ, Erzincan, Erzurum, Giresun, Gümüşhane, Iğdır, Isparta, İzmir, Kahramanmaraş, Karabük, Kastamonu, Kayseri, Kırıkkale, Kocaeli, Konya, Kütahya, Malatya, Manisa Mardin, Muş, Niğde, Osmaniye, Samsun, Sinop, Siirt, Şanlıurfa, Tokat, Van (Horváth 1883, Fahringer 1922, Gadeau de Kerville 1939, Linnavuori 1954, Hoberlandt 1956, Lodos *et al.* 1978, 1998, Lodos & Önder 1982, Kıyak 1990 as *S. atticus*, 2000, 2016, Önder *et al.* 1995, Özgen *et al.* 2005b, Fent 2010, Dursun & Fent 2011b, Gözüaçık *et al.* 2011, Fent & Japoshvili 2012, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Özgen & Dioli 2018, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Crete, Croatia, Czech Republic, European Kazakhstan, European Türkiye, France, Greece, Hungary, Italy, Macedonia, Moldavia, Montenegro, Portugal, Romania, Russia (ST), Serbia, Slovakia, Slovenia, Spain, Ukraine. North Africa: Algeria, Morocco, Tunisia. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Israel, Kirgizia, Lebanon, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Tribe STRACHIINI Mulsant & Rey

Genus *Bagrada* Stål

Subgenus *Nitilia* Mulsant & Rey

Bagrada abeillei Puton, 1881

Asian Türkiye: Adıyaman, Artvin, Batman, Bayburt, Diyarbakır, Elazığ, Erzurum, Gaziantep, Iğdır, Hatay, Kahramanmaraş, Kilis, Siirt, Şanlıurfa (Horváth 1936 as *B. abeillei* and *B. lepida*, Önder *et al.* 1995 as *B. abeillei* and *B. lepida*, Lodos *et al.* 1998, Derjanschi & Péricart 2005, Fent *et al.* 2010b, Gözüaçık *et al.* 2011, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Özgen & Dioli 2018, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Greece. North Africa: Egypt. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Georgia, Iran, Iraq, Israel, Lebanon, Saudi Arabia, Syria.

Bagrada amoenula (Walker, 1870)

Asian Türkiye: Adıyaman, Iğdır, Şanlıurfa (Fent *et al.* 2010b, Gözüaçık *et al.* 2011, Dursun & Fent 2015).

General Distribution: North Africa: Algeria, Egypt, Libya, Morocco. Asia: Asian Türkiye, Iran, Iraq, Israel, Saudi Arabia, Sinai, Yemen. Extralimital: Sudan.

Bagrada concinna Horváth, 1936

Asian Türkiye: Ankara, Gaziantep, Hatay, Kahramanmaraş (Horváth 1936, Hoberlandt 1956 as *B.*

concinna and B. *concinna* var. *biramosa*, Önder *et al.* 1995, Lodos *et al.* 1998).

General Distribution: Asia: Armenia, Asian Türkiye, Azerbaijan, Iran, Syria.

Bagrada funerea Horváth, 1901

Asian Türkiye: Adana (Horváth 1901, 1936)

General Distribution: Asia: Asian Türkiye, Cyprus, Syria.

Bagrada kaufmanni (Oshanin, 1871)

Asian Türkiye: Artvin, Erzurum, İçel (Lodos *et al.* 1998, Külekçi *et al.* 2009)

Asia: Afghanistan, Asian Kazakhstan, Asian Türkiye, China (NW), Iran, Tadzhikistan, Turkmenistan, Uzbekistan.

Bagrada stolida (Herrich-Schaeffer, 1839)

= *Bagrada stolata* Horváth, 1936

Asian Türkiye: Anatolia (Horváth 1936 as *B. gibbicollis*), Bursa (Horváth 1936 as *B. stolata var. quadrimaculata*) Kayseri (Horváth 1936 as *B.cicur* and *B. cicur* var. *scutellaris*), İzmir (Horváth 1936 as *B.confusa*), Amasya, Ankara, Aydın, Batman, Burdur, Bursa, Diyarbakır, Elazığ, Gaziantep, İzmir, Kahramanmaraş, Karaman, Kayseri, Kırşehir, Kilis, Mardin, Muğla, Şanlıurfa, Tokat (Lodos *et al.* 1978, 1998 as *B. stolata*, Kıyak 1993 as *B. stolata*, Önder *et al.* 1995 as *B. cicur*, Derjanschi & Péricart 2005, Özgen *et al.* 2005b as *B. confusa*, Dursun & Kartal 2008c, Dursun & Fent 2011b, Matocq *et al.* 2014).

General Distribution: Europe: Bulgaria, European Kazakhstan, Greece, Hungary, Italy (Sicily), Macedonia, Romania, Russia (CT ST), Slovakia, Ukraine. Asia: Asian Kazakhstan, Asian Türkiye, China (NW), Iran, Turkmenistan.

Bagrada turcica Horváth, 1936

Asian Türkiye: Ankara (Horváth 1936).

General Distribution: Europe: Macedonia. Asia: Asian Türkiye.

Genus Eurydema Laporte

Subgenus *Eurydema* Laporte

Eurydema laticollis Horváth, 1907

Asian Türkiye: Diyarbakır, Elazığ, Iğdır, Mersin, Muş (Wagner 1959, Yılmaz, 1996, Derjanschi & Péricart 2005, Önder *et al.* 2006, Kment & Jindra 2008, Külekçi *et al.* 2009, Matocq *et al.* 2014, Çerçi *et al.* 2018).

General Distribution: Europe: Russia (ST). Asia: Asian Türkiye, Iran.

Eurydema oleracea (Linnaeus, 1758)

Material examined: Çanakkale: Eceabat-Behramlı (100 m): 08.06.2001, 2 ♀♀; Gelibolu- Güneyli (50 m): 31.05.1999, ♂; Cumalı (40 m): 07.06.2001, ♀; Edirne: Center-Avarız (55 m): 20.04.1994, ♀; Lalapaşa-Doğanköy (350 m): 01.09.2001, 3 ♂♂; İstanbul: Çatalca-Kızılcaali (50 m): 14.06.2001, 5 ♀♀, ♂; Silivri-Beyciler (140 m): 15.08.1997, ♂; Kırklareli: Center-Dereköy (300 m): 17.07.2001, 5 ♀♀, 5 ♂♂; Çağlayık (620 m): 28.06.2002, ♀, 2 ♂♂; Demirköy-Sislioba (400 m): 25.07.2001, 3 ♂♂; Kofçaz-Erikler (430 m): 02.08.2000, 2, ♂♂; Ahmetler (570 m): 17.07.2001, ♀; Beyci (350 m): 17.07.2001, ♂; Lüleburgaz- Çengelli (50 m): 16.08.2000, ♀, ♂; Kırık (190 m): 28.08.2002, 2 ♀♀; Pınarhisar-Mahya Hill (880 m): 07.06.2003, ♀; Mahya Hill (1030 m): 07.06.2003, 2 ♀♀, ♂; Mahya Hill (840 m): 07.06.2003, ♂; Tekirdağ: Center-Işıklar (Ganos Mountains) (200 m): 18.05 2003, ♀; Saray (180 m): 16.06.2001, ♀; Şarköy-Emirali (200 m): 30.07.1998, ♀, ♂; between Emirali-Çınarlıdere (210 m): 31.05.1999, ♂.

European Türkiye: Çanakkale, Edirne, Kırklareli, Tekirdağ (Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999, Fent 2011).

Asian Türkiye: Adana, Adapazarı, Afyonkarahisar, Amasya, Ankara, Antalya, Ardahan, Balıkesir, Bartın, Bayburt, Bilecik, Bolu, Bursa, Çanakkale, Çankırı, Çorum, Eskişehir, Erzincan, Erzurum, Gaziantep, Giresun, Gümüşhane, Iğdır, Isparta, İstanbul, İzmir, Kahramanmaraş, Kars, Kastamonu, Kocaeli, Konya, Kütahya, Manisa, Mersin, Niğde, Ordu, Osmaniye, Rize, Samsun, Sakarya, Sinop, Tokat, Trabzon, Tunceli, Uşak, Yalova, Yozgat, Zonguldak (Horváth 1883, Puton 1892, Escherich 1897, Kiritshenko 1918, Fahringer 1922, Hoberlandt 1956, Seidenstücker 1975 as *Eurydema lineola*, Lodos *et al.* 1978, 1998, Kıyak 1993, Önder *et al.* 1995, Özsaraç *et al.* 2001, Dursun & Kartal 2008c, Külekçi *et al.* 2009, Fent 2010, Dursun & Fent 2011b, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Andorra Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Great Britain, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Azores?, Morocco, Tunisia. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (WP) Georgia, Iran, Israel, Mongolia, Russia (ES WS), Syria, Tadzhikistan.

Eurydema ornata (Linnaeus, 1758)

Material examined: Çanakkale: Eceabat-Küçükanafarta (20 m): 08.06.2001, ♀; between Kabatepe-Alçıtepe (Türk Şehitliği) (50 m): 08.06.2001, ♀; Behramlı (100 m): 08.06.2001, 2 ♀♀, ♂; Kemalyeri (60 m): 12.08.2001, 2 ♀♀, ♂; Gelibolu-Süleymaniye (50 m): 30.07.1998, ♂; Güneyli (50 m): 31.05.1999, ♀, 2 ♂♂; Fındıklı (105 m): 07.06.2001, ♀; Kavak (20 m):

07.06.2001, ♂; Ilgardere (20 m): 11.08.2001, 2 ♀♀, 2 ♂♂; Kocaçeşme (Korudağı) (350 m): 20.05.2003, ♂; Edirne: Center-Balkan Campus (41 m): 23.07.2001, ♀; 12.09.2001, 2 ♂♂; 28.05.2002, ♀; Suakacağı (150 m): 05.07.1997, 2 ♀♀, 2 ♂♂; Karaağaç (41 m): 21.05.2003, ♀; Havsa-Hasköy (95 m): 11.05.2001, 2 ♀♀, 3 ♂♂; Lalapaşa-Hacıdanişment (500 m): 05.07.1997, ♀ ; Doğanköy (350 m) 05.07.1997, 2 ♂♂; Sinanköy (300 m): 02.08.2000, ♀, ♂; Süleoğlu-Baraj (175 m): 24.05.2002, 2 ♀♀, ♂; 25.07.2002, 10 ♀♀, 5 ♂♂; İstanbul: Gaziosmanpaşa-Boğazköy (60 m): 15.06.2001, ♂; Büyükçekmece-Tepecik (20 m): 28.08.1998, 2 ♂♂; Çatalca-Durusu (110 m): 14.06.2001, ♂; Ormanlı (75 m): 29.08.1998, ♂; Oklalı (60 m): 14.06.2001, 3 ♀♀, 2 ♂♂; Kızılcaali (50 m): 14.06.2001, 2 ♀♀; Ömerli (80 m): 15.06.2001, 2 ♀♀; Silivri (50 m): 25.08.1992, 2 ♀♀; Çantaköy (50 m): 2 ♀♀, 2 ♂♂; Kırklareli: Center-Ürünlü (60 m): 11.05.2001, 4 ♀♀, 4 ♂♂; 27.06.2002, 2 ♀♀, 2 ♂♂; Çağlayık (620 m): 25.08.1998, 2 ♀♀, 3 ♂♂; Kuzucu (300 m): 25.08.1998, 3 ♀♀, 2 ♂♂; Dereköy (300 m): 17.07.2001, ♀, 2 ♂♂ ; Kaynarca (125 m): 27.06.2002, 6 ♀♀, 3 ♂♂; Babaeski-Yeniköy (65 m): 11.05.2001, 4 ♀♀, 3 ♂♂; Taşköprü (200 m): 11.05.2001, 3 ♀♀; Demirköy-Sislioba (400 m): 25.07.2001, ♀; Sarpdere (300 m): 26.05.2002, ♀; Kofçaz-Erikler (430 m): 02.08.2000, 2, ♂♂; Ahmetler (570 m): 17.07.2001, ♂; Beyci (350 m): 17.07.2001, 2 ♀♀, 5 ♂♂; Lüleburgaz-Büyükkarıştıran, (75 m): 10.08.1997, ♀; Sarıcaali (50 m): 13.08.1997, ♀; Pınarhisar- Poyralı (310 m): 27.06.2002, ♀; Üsküp-Kurudere (320 m): 27.06.2002, ♀; Hacıfakılı (300 m): 27.06.2002, ♀; Vize (200 m): 27.08.1998, ♀; between Kıyıköy-Kömürköy (200 m): 16.06.2001, ♀; Tekirdağ: Center-Köseilyas (50 m): 02.08.1998, 2 ♂♂; Oruçbeyli (200 m): 07.08.2001, 2 ♀♀, 4 ♂♂; 18.05.2003, 2 ♀♀; between Ormanlı-Hoşköy (700 m): 18.05.2003, ♀; Işıklar (Ganos Mountains) (200 m): 18.05 2003, 5 ♀♀; Çerkezköy-Veliköy (130 m): 11.08.1997, 3 ♀♀, 3 ♂♂; Çorlu-Önerler (50 m): 17.05.2002, ♂; Hayrabolu-Tatarlı (210 m): 29.07.1998, ♂; Örenköy (200 m): 19.05.2002, ♀, 2 ♂♂; Hedeyli (150 m): 23.05.2002, 2 ♂♂; Malkara-Izgar Village (200 m): 26.09.1992, ♀; 28.07.1998, 2 ♂♂; 05.05.2001, 4 ♀♀, ♂; between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♀; Mahramlı (Cumhuriyet Ormanı) (230 m): 07.08.2001, ♂; Sağlamtaş (170 m): 08.08.2001, ♂; Yenidibek (210 m): 14.09.2001, ♂; Çorlu-Yeniçiftlik (20 m): ♀; Muratlı (50 m): 26.08.1992, ♀; 09.06.2001, 2 ♀♀, ♂; Hanoğlu (60 m): 09.06.2001, 2 ♀♀; Aydınköy (70 m): 18.05.2002, ♀; İsmailli (60 m): 18.05.2002, ♀, ♂; Saray (180 m): 16.06.2001, 3 ♀♀, 2 ♂♂; Saray (180 m): 16.06.2001, 4 ♀♀, 2 ♂♂; Sinanlı (105 m): 11.09.1997, ♀; Şarköy-Emirali (200 m): 30.07.1998, ♂; between Emirali-Çınarlıdere (210 m): 31.05.1999, 2 ♀♀; Ormanlı (75 m): 08.08.2001, ♀, 2 ♂♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Horváth 1918, Hoberlandt 1956, Wagner 1966, Lodos *et al.* 1978, Önder *et al.* 1984, Yılmaz, 1996, Fent & Aktaç 1999, Fent 2011, Yazıcı *et al.* 2014, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adapazarı, Adıyaman, Afyonkarahisar, Ağrı, Aksaray, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Batman, Bayburt, Bilecik, Bitlis, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Düzce, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hakkari, Hatay, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Karaman, Kars, Kastamonu, Kayseri, Kırıkkale, Kilis, Kocaeli, Konya, Kütahya, Malatya, Manisa, Mardin, Mersin, Muğla, Nevşehir, Niğde, Osmaniye, Sakarya, Samsun, Sinop, Sivas, Şanlıurfa, Şırnak, Tokat, Trabzon, Tunceli, Uşak, Yalova, Yozgat, Zonguldak (Horváth 1883, 1901, 1919, Puton & Noualhier 1895, Escherich 1897, Fahringer 1922, Gadeau de Kerville 1939, Hoberlandt 1956, Wagner 1959, 1966, Linnavuori 1965, Lodos *et al.* 1978, 1998, Kıyak 1990, 1993, 2000, Önder *et al.* 1983, 1995, Yılmaz, 1996, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Özgen *et al.* 2005a, b, Dursun & Kartal 2008c, Karsavuran *et al.* 2008, Demirel, 2009, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011b, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi *et al.* 2018, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021, Çerçi & Özgen 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, European Kazakhstan, European Türkiye, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Malta, Macedonia, Moldavia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Canary Islands, Egypt, Libya, Morocco, Madeira, Tunisia. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO NW SW WP), Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kuwait, Mongolia, Russia (ES WS), Sinai, Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Ethiopia, India, Pakistan.

Eurydema putoni (Jakovlev, 1877)

Asian Türkiye: Erzurum (Kiritshenko 1918 as *E. putoni* var. *colaratum*), Bilecik, Bingöl, Diyarbakır, Elazığ, Erzurum, Gaziantep, Giresun, Hatay, Kahramanmaraş, Kütahya, Malatya, Mardin, Niğde, Van (Puton & Noualhier 1895, Puton 1895, Horváth 1917, Seidenstücker 1960, Lodos *et al.* 1978, 1998, Yılmaz, 1996, Derjanschi & Péricart 2005, Önder *et al.* 1995, 2006, Külekçi *et al.* 2009, Özgen 2012, Matocq *et al.* 2014, Kıyak 2016).

General Distribution: Europe: Russia (ST). Asia: Afghanistan, Armenia, Asian Türkiye, Azerbaijan, Iran, Israel, Iraq, Syria.

Note: All researchers given this species as *Eurydema formosum* except for Derjanschi & Péricart (2005), Özgen

(2012) and Matocq *et al.* (2014), who followed the synonymy with *Eurydema putoni* by Péricart (2004).

Subgenus *Horvatheurydema* Dupuis
Eurydema caligata Horváth, 1901

Asian Türkiye: Hatay (Horváth 1901 as *Eurydema fieberi* var. *caligatum*).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia.

Eurydema fieberi Fieber, 1837

Asian Türkiye: Adana Siirt (Horváth, 1901 as *E. fieberi* var. *armaniacum*, Derjanschi & Péricart 2005), Bursa (Horváth 1901, as *E. fieberi* var. *caucasicum*), Batman, Diyarbakır (Wagner 1959 as *E. armaniacum*), Adana, Adıyaman, Amasya, Ankara, Antalya, Bayburt, Bingöl, Burdur, Diyarbakır, Elazığ, Erzincan, Erzurum, Gaziantep, Giresun, Hakkari, Hatay, Kahramanmaraş, Karaman, Kastamonu, Kırşehir, Kilis, Konya, Kütahya, Malatya, Mardin, Mersin, Muş, Nevşehir, Niğde, Osmaniye, Sivas, Şanlıurfa, Tokat (Eschrerich, 1897, Kiritshenko 1918, Hoberlandt 1956, Önder *et al.* 1995, Yılmaz, 1996, Lodos *et al.* 1978, 1998, Kıyak 1993, Derjanschi & Péricart 2005, Dursun & Kartal 2008c, Kment & Jindra 2008, Dursun & Fent 2011b, Gözüaçık *et al.* 2011, Özgen 2012, Matocq *et al.* 2014, Yazıcı *et al.* 2014).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Hungary, Italy, Macedonia, Montenegro, Poland, Portugal, Romania, Russia (ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Morocco. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Georgia, Iran, Iraq, Israel, Mongolia, Russia (ES) Syria, Tadzhikistan, Uzbekistan. Extralimital: India.

Eurydema rugulosa (Dohrn, 1860)

Material examined: Edirne: Keşan (200 m): 21.06.2000, ♀; Tekirdağ: Center-Uçmakdere (300 m): 06.08.1998, ♂.

European Türkiye: Thrace (Reuter 1900 as *E. rugulosum* var. *nigrorubrum*), Çanakkale, Tekirdağ (Lodos *et al.* 1978, Josifov 1986, Yılmaz, 1996, Kıvan 1998).

Asian Türkiye: Ankara, Hatay, İzmir (Horváth 1901 as *E. rugulosum* var. *nigrorubrum* and *E. rugulosum* var. *rubrum*, Gadeau de Kerville 1939 as *E. rugulosum* var. *nigrorubrum*, Hoberlandt 1956 as *E. rugulosum* var. *nigrorubrum*), Adana, Amasya, Ankara, Antalya, Balıkesir, Bilecik, Bursa, Diyarbakır, Elazığ, Gaziantep, Hatay, İçel, İzmir, Karaman Kahramanmaraş, Karaman, Kastamonu, Konya, Kütahya, Manisa, Mardin, Mersin, Muğla, Sivas, Tokat, Uşak (Reuter 1890, Puton 1892, Escherich 1897, Horváth 1901, 1917, Hoberlandt 1956, Lodos *et al.* 1978, 1998, Kıyak 1993, Önder *et al.* 1995, Yılmaz, 1996, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Derjanschi & Péricart 2005, Dursun & Kartal 2008c, Fent 2010, Dursun & Fent 2011b, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014).

General Distribution: Europe: Bulgaria, European Türkiye, Greece, Macedonia. North Africa: Egypt. Asia: Afghanistan, Asian Türkiye, Cyprus, Iran, Israel, Jordan, Lebanon, Sinai, Syria. Extralimital: Eritrea, Ethiopia.

Subgenus *Rubrodorsalium* Stichel
Eurydema blanda Horváth, 1903

Material examined: Çanakkale: Gelibolu-Kavak (20 m): 07.06.2001, ♀; İstanbul: Çatalca- Kızılcaali (50 m): 14.06.2001, 4 ♀♀, ♂; Kırklareli: Demirköy-Balaban (Velika Deresi) (500 m): 26.05.2002, 2 ♀♀; Pınarhisar-Mahya Hill (880 m): 07.06.2003, 2 ♀♀; Mahya Hill (1030 m): 07.06.2003, 3 ♀♀, 2 ♂♂; Mahya Hill (800 m): 07.06.2003, , 3 ♂♂ 2 ♀♀; Mahya Hill (840 m): 07.06.2003, 4 ♀♀, 3 ♂♂; Tekirdağ: Center-Nusratfakı (120 m): 09.06.2001, ♂; Çorlu-Yeniçiftlik (20 m): 3 ♀♀, 4 ♂♂; Hayrabolu-Örenköy (200 m): 19.05.2002, ♂; Hedeyli (150 m): 23.05.2002, ♀; Şarköy-between Emirali-Çınarlıdere (210 m): 31.05.1999, ♂.

European Türkiye: Edirne, Kırklareli, (Yılmaz, 1996, Fent & Aktaç 2002).

Asian Türkiye: Adana, Afyonkarahisar, Akşehir, Amasya, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bilecik, Bolu, Burdur, Çanakkale, Çankırı, Çorum, Denizli, Erzurum, Gaziantep, Gümüşhane, Hakkari, Iğdır, Isparta, İstanbul, İzmir, Kahramanmaraş, Karaman, Kars, Kastamonu, Kırıkkale, Kocaeli, Konya, Kütahya, Manisa, Malatya, Mersin, Muğla, Niğde, Ordu, Samsun, Sivas, Şırnak, Tokat, Uşak, Yalova (Horváth 1903a, Hoberlandt 1956, Lodos *et al.* 1978, 1998, Kıyak 1993, Yılmaz, 1996, Suludere *et al.* 1999, Dursun & Kartal 2008c, Karsavuran *et al.* 2008, Külekçi *et al.* 2009, Fent 2010, Dursun & Fent 2011b, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Crete, European Türkiye, Greece. Asia: Armenia, Asian Türkiye, Azerbaijan, Georgia, Iran.

Eurydema dominulus (Scopoli, 1763)

Asian Türkiye: Ankara (Gadeau de Kerville 1939, Hoberlandt 1956, Önder *et al.* 2006).

General Distribution: Europe: Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Great Britain, Germany, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Poland, Romania, Russia (CT NT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (CE NE NO NW SE SW WP), Iran, Iraq, Japan, Korea, Mongolia, Russia (ES FE WS), Taiwan. Extralimital: Australia, Oriental Region.

Eurydema spectabilis Horváth, 1882

European Türkiye: Tekirdağ (Wagner 1966).

Asian Türkiye: Adana (Hoberlandt 1956 as *E. mrugowskyi*), Adana, Antalya, Bartın, Çorum, Hatay, İçel, İzmir, Manisa, Mersin, Muğla, Samsun, Sivas, Şanlıurfa, Tokat, Zonguldak (Wagner 1966, Lodos *et al.* 1998, Yılmaz, 1996, Lodos *et al.* 1998, Dursun & Kartal 2008c, Kment & Jindra 2008, Şerban 2010, Dursun & Fent 2011b).

General Distribution: Europe: Albania, Bulgaria, Crete, European Türkiye, Greece, Romania, Russia (ST), Ukraine. Asia: Asian Türkiye, Georgia, Iran, Israel, Syria.

Eurydema ventralis Kolenati, 1846

Material examined: Edirne: Center-Sarayiçi (Tavukormanı) (41 m): 07.05.2002, ♂; Lalapaşa-Doğanköy (350 m): 05.07.1997, ♂; Süleoğlu-Baraj (175 m): 25.07.2002, 6 ♀♀, 3 ♂♂; Kırklareli: Center-Dereköy (300 m): 17.07.2001, 2 ♂♂; 28.06.2002, ♂; Demirköy (250 m): 06.07.1997, ♂; Kaynarca (125 m): 27.06.2002, 3 ♀♀, ♂; Kofçaz (500 m): 29.06.2002, 2 ♀♀; Ürünlü (60 m): 27.06.2002, 2 ♀♀, ♂; Pınarhisar-Poyralı (310 m): 27.06.2002, ♀, ♂; Hacıfaklı (300 m): 27.06.2002, ♂; Üsküp-Kurudere (320 m):27.06.2002, ♂; Tekirdağ: Center-Köseilyas (50 m): 02.08.1998, ♀; Şarköy-Ormanlı (75 m): 08.08.2001, ♂; İstanbul: Çatalca-Oklalı (60 m): 14.06.2001, ♂.

European Türkiye: Çanakkale, Edirne, Kırklareli, İstanbul, Tekirdağ (Horváth 1918, Fahringer 1922, Lodos *et al.* 1978, Yılmaz, 1996, Fent & Aktaç 1999, Fent 2011, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adapazarı, Afyonkarahisar, Ağrı, Amasya, Ankara, Antalya, Artvin, Balıkesir, Bayburt, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Diyarbakır, Giresun, Erzincan, Erzurum, Hakkari, Hatay, Iğdır, Isparta, İzmir, Kahramanmaraş, Karaman, Kastamonu, Kırşehir, Konya, Kocaeli, Kütahya, Manisa, Muğla, Muş, Niğde, Sinop, Sivas, Şırnak, Tokat, Tunceli, Uşak (Horváth 1883, Escherich 1897, Kiritshenko 1918, Gadeau de Kerville 1939, Hoberlandt 1956, Wagner 1966, Lodos *et al.* 1978, 1998, Kıyak 1993, 2000, 2016, Yılmaz, 1996, Derjanschi & Péricart 2005, Özgen *et al.* 2005b, Dursun & Kartal 2008c, Karsavuran *et al.* 2008, Demirel 2009, Fent 2010, Şerban 2010, Dursun & Fent 2011b, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi & Gözüaçık 2019, Bulak & Yıldırım 2021).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, European Kazakhstan, European Türkiye, France, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Malta, Macedonia, Moldavia, Netherlands?, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Egypt, Morocco. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NO NW SE SW), Cyprus, Iran, Iraq, Israel, Lebanon, Russia (ES WS), Syria.

Genus *Stenozygum* Fieber
Subgenus *Stenozygum* Fieber
Stenozygum coloratum (Klug, 1845)

Asian Türkiye: Adana, Antalya, İçel, Mersin (Hoberlandt 1956, Lodos *et al.* 1998, Derjanschi & Péricart 2005, Önder *et al.* 2006, Yazıcı *et al.* 2014).

General Distribution: Europe: Greece. North Africa: Egypt. Asia: Asian Türkiye, Cyprus, Iran, Iraq, Israel, Jordan, Lebanon, Saudi Arabia, Sinai, Syria, Yemen. Extralimital: Ethiopia, Kenya, Sudan.

Genus *Trochiscocoris* Reuter
Trochiscocoris hemipterus (Jakovlev, 1879)
= *Trochiscocoris sanguinolentus* Horváth, 1895

Asian Türkiye: Adana, Diyarbakır, Elazığ, Karaman, Konya, Nevşehir (Horváth 1895 as *T. sanguinolentus*, Seidenstücker 1958 as *T. sanguinolentus*, Lodos *et al.* 1998 as *T. sanguinolentus* and *T. hemipterus*, Matocq *et al.* 2014, Çerçi & Özgen 2021).

General Distribution: Europe: Russia (ST: Caucasus), Spain. North Africa: Morocco. Asia: Armenia, Asian Türkiye, Azerbaijan, Iran.

Trochiscocoris rotundatus rotundatus Horváth, 1895

European Türkiye. Çanakkale (Fent & Dursun 2016).

Asian Türkiye: Adıyaman, Amasya, Ankara, Bursa, Kastamonu, Konya, Tokat (Seidenstücker 1960, Kıyak 1993, Derjanschi & Péricart 2005, Önder *et al.* 2006, Dursun & Kartal 2008c, Fent 2010, Dursun & Fent 2011b).

General Distribution: Europe: Bulgaria, Croatia, European Türkiye, Greece, Italy, Macedonia, Montenegro, Romania, Russia (ST: Caucasus), Serbia. Asia: Asian Türkiye, Georgia.

Subfamily PODOPINAE Amyot & Serville
Tribe GRAPHOSOMATINI Mulsant & Rey
Genus *Ancyrosoma* Amyot & Serville
Ancyrosoma leucogrammes (Gmelin, 1790)

Material examined: Çanakkale: Eceabat-Kemalyeri (60 m): 12.08.2001, ♀, ♂; Gelibolu-Cumalı (40): 07.06.2000, ♂; Ilgardere (20 m): 08.06.2001, 3♀♀, 3 ♂♂; between Kabatepe-Alçıtepe (50 m): 08.06.2001, 2♀♀, ♂; Şadıllı (140 m): 19.05.2003, ♀; Edirne: Center-Suakacağı (150 m): 05.07.1997, ♀, ♂; 01.09.2001, ♀, ♂; Keşan (Korudağı) (300 m): 07.06.2001, ♂; Süleoğlu-Baraj (175 m): 24.05.2002, 2 ♂♂; Lalapaşa-Doğanköy (350 m) 05.07.1997, 2 ♀♀, 2 ♂♂; Kalkansöğüt (400 m): 05.07.1997, ♂; Ömeroba (310 m): 02.08.2000, ♀; Hatay: Hassa-Aktepe, (213 m), 20.5.2010, 2♀♀ 2♂♂; İstanbul: Gaziosmanpaşa-Boğazköy (60 m): 15.06.2001, ♀; Bahçeköy-Bilezikçi Çiftliği (25 m): 24.06.1993, ♀; Çatalca-Kabakça (100 m): 28.08.1998, ♂; Kızılcaali (50 m): 14.06.2001, ♀; Ömerli (80 m): 15.06.2001, ♀; Binkılıç (125 m): 18.09.2001, ♂; Sarıyer-Zekeriyaköy (0 m): 14.06.2001, ♂; Silivri-Beyciler (140 m): 15.08.1997, ♀; Çantaköy (50 m): 28.08.1998, ♀;

Kırklareli: Center-Ürünlü (60 m): 21.08.1992, 2 ♀♀; Çağlayık (620 m): 25.08.1998, ♀, ♂; Kuzucu (300 m): 25.08.1998, ♂; Dereköy (300 m): 17.07.2001, 2 ♂♂; between Dereköy-Çağlayık (600 m): 28.06.2002, ♀; Babaeski-Yeniköy (65 m): 11.05.2001, ♂; Demirköy- between Yeşilce-Avcılar (350 m): 25.07.2001, ♂; Kofçaz-Erikler (430 m): 02.08.2000, 2♀♀; Kofçaz (500 m): 02.08.2000, ♀; Beyci (350 m): 17.07.2001, ♀, ♂; Lüleburgaz- Büyükkarıştıran (75 m): 10.08.1997, ♀; Ceylanköy (70 m): 26.08.1998, ♀; Kırık (190 m): 28.08.2002, ♀; Üsküp-Kurudere (320 m): 27.06.2002, ♀; Vize- between Kıyıköy-Kömürköy (200 m): 16.06.2001, ♀; Tekirdağ: Center-Uçmakdere (300 m): 06.08.1998, ♂; Nusratfakı (120 m): 09.06.2001, ♀, ♂; Banarlı (150 m): 09.06.2001, ♀, 2 ♂♂; Çerkezköy-Veliköy (130 m): 11.08.1997, ♂ ; Hayrabolu-Dambaslar (110 m): 16.08.1997, 2 ♀♀, ♂; Tatarlı (210 m): 29.07.1998, ♀; Malkara-Izgar Village (200 m): 28.07.1998, ♂; between Karaiğdemir-Evrenbey (100 m): 29.07.1998, ♂; Karacahalil (210 m): 14.09.2001, ♂; Danişment (Korudağı) (250 m): 15.09.2001, ♀, ♂; Şarköy (0 m): 30.07.1998, ♀; Ulaman (100 m): 09.08.2001, ♀, ♂; Yayaköy (230 m): 09.08.2001, ♂; Yeniköy (200 m): 10.08.2001, 2 ♀♀; Muratlı-Arzulu (50 m): 09.06.2001, ♀; Hanoğlu (60 m): 09.06.2001, 3♀♀, ♂; Saray-Büyükyoncalı (200 m): 26.08.1998, ♀; Saray (180 m): 16.06.2001, ♀; Şarköy-Ormanlı (75 m): 08.08.2001, ♂; Ulaman (100 m): 09.08.2001, ♀.

European Türkiye: Çanakkale, Edirne, Tekirdağ (Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Şerban 2010, Fent 2011, Orçan & Kıvan 2017).

Asian Türkiye: Adana, Adıyaman, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bilecik, Burdur, Bursa, Batman, Çanakkale, Çorum, Denizli, Diyarbakır, Elazığ, Erzurum, Gaziantep, Hatay, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Kastamonu, Kayseri, Konya, Kırklareli, Malatya, Manisa, Mardin, Mersin, Muğla, Nevşehir, Sakarya, Siirt, Sinop, Şanlıurfa, Tunceli (Horváth 1883, 1919, Puton 1892, Kiritshenko 1918, Fahringer 1922, Gadeau de Kerville 1939, Hoberlandt 1956, Wagner 1959, 1966, Lodos *et al.* 1978, 1998, Kıyak 1990, Önder *et al.* 1995, Kıyak *et al.* 2004, Fent 2010, Şerban 2010, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Özgen & Dioli 2018, Çerçi & Özgen 2021, Özgen *et al.* 2021).

General Distribution: Europe: Albania, Austria?, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Hungary, Italy, Malta, Macedonia, Montenegro, Portugal, Romania, Russia (ST), Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Canary Islands, Egypt, Libya, Morocco, Tunisia. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kirgizia, Mongolia, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Genus *Derula* Mulsant & Rey

Derula delagrangei Puton, 1892

Asian Türkiye: Adıyaman, Diyarbakır, Gaziantep, Hatay, Kilis, Mardin (Puton 1892, Hoberlandt 1956, Seidenstücker 1960, Önder *et al.* 1995, 2006, Lodos *et al.* 1998).

General Distribution: Asia: Asian Türkiye, Iran.

Derula flavoguttata Mulsant & Rey, 1856

Material examined: Çanakkale: Gelibolu-Süleymaniye (50 m): 30.07.1998, ♂; Edirne: Center-Uzunbayır (200 m): 03.07.1997, 2 ♀♀, ♂; Lalapaşa-Ömeroba (310 m): 02.08.2000, 2♀♀; İstanbul: Bahçeköy-Bilezikçi Çiftliği (25 m): 24.06.1993, ♂; Silivri-Beyciler (140 m): 15.08.1997, ♀; Hatay: Hassa-Aktepe, (213 m), 20.5.2010, ♀; Kırklareli: Center-Dereköy (300 m): 17.07.2001, 4 ♀♀; Ürünlü (60 m): 21.08.1992, ♀; Çukurpınar (500 m): 25.08.1998, 2 ♀♀; Lüleburgaz-Ceylanköy (70 m): 26.08.1998, ♀; Pınarhisar-Mahya Hill (880 m): 07.06.2003, 2 ♀♀; Tekirdağ: Hayrabolu-Dambaslar (110 m): 16.08.1997, ♀; Malkara-between Karaiğdemir-Evrenbey (100 m): 29.07.1998, 2 ♀♀; Muratlı- Hanoğlu (60 m): 09.06.2001, 2 ♀♀.

European Türkiye: Edirne, Kırklareli (Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999).

Asian Türkiye: Adana, Adıyaman, Antalya, Bolu, Bursa, Diyarbakır, Düzce, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Iğdır, Isparta, İçel, Hatay, Kars, Kastamonu, Kütahya, Sinop, Sivas (Horváth 1883, Puton 1892, Fahringer 1922, Lodos *et al.* 1978, 1998, Kıyak 1990, Önder *et al.* 1995, Fent 2010, Gözüaçık *et al.* 2011, Fent & Japoshvili 2012, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Özgen & Dioli 2018, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Croatia, European Türkiye, France, Greece, Hungary, Italy, Macedonia, Romania, Russia (ST: Caucasus), Serbia, Slovakia, Spain, Ukraine. Asia: Armenia, Asian Türkiye, Azerbaijan, Georgia, Iran.

Genus *Graphosoma* Laporte

Subgenus *Graphosoma* Laporte

Graphosoma alkani Lodos, 1959

Asian Türkiye: Diyarbakır, Mardin (Lodos 1959).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia.

Graphosoma consimile Horváth, 1903

Asian Türkiye: Elazığ, Kayseri (Seidenstücker 1975, Kıyak 1990).

General Distribution: Afghanistan, Asian Kazakhstan, Asian Türkiye, Georgia, Iran, Kirgizia, Tadzhikistan, Turkmenistan, Uzbekistan.

Graphosoma italicum italicum (O.F. Müller, 1766)
= *G. lineatum* (Linnaeus, 1758) *auct.*

Material examined: Çanakkale: Gelibolu-Ilgardere (20 m): 08.06.2001, 4 ♀♀, 3 ♂♂; Eceabat-between Kabatepe-Alçıtepe (50 m): 08.06.2001, 3 ♀♀, ♂; Edirne: Center (41m): 10.04.1995, 2 ♀♀; Uzunbayır (200 m): 03.07.1997, ♂; Suakacağı (150 m): 05.07.1997, ♀, ♂; Lalapaşa-Hacıdanişment (500 m): 03.07.1997, ♂; Kalkansöğüt (400 m): 05.07.1997, ♂; Doğanköy (350 m): 01.09.2001, 2 ♀♀, ♂; İstanbul: Gaziosmanpaşa-Boğazköy (60 m): 15.06.2001, ♂; Bahçeköy-Bilezikçi Çiftliği (25 m): 24.06.1993, ♂; Çatalca-Subaşı (100 m): 03.10. 1992, ♀; Karacaköy (100 m): 03.10.1992, 2 ♂♂; Danamandıra (150 m): 15.08.1998, ♀; Oklalı (60 m): 14.06.2001, ♀; Kızılcaali (50 m): 14.06.2001, ♂; Sarıyer-Zekeriyaköy (0 m): 14.06.2001, ♂; Silivri-Beyciler (140 m): 15.08.1997, ♀, ♂; Kırklareli: Center-Ürünlü (60 m): 21.08.1992, ♀; Çağlayık (620 m): 25.08.1998, 2 ♀♀; Demirköy-Sivriler (350 m): 27.08.1998, 2 ♀♀, ♂; Sislioba (400 m): 25.07.2001, ♀, ♂; Sergen (290 m): 29.08.2002, ♀; Tozaklı (200 m): 29.08.2002, ♂; Kofçaz (500 m): 02.08.2000, ♀; Lüleburgaz- Büyükkarıştıran, (75 m): 10.08.1997, ♀; Evrensekiz (90 m): 12.08.1997, ♀; Sarıcaali (50 m): 13.08.1997, ♀; Pınarhisar-Poyralı (310 m): 27.06.2002, 2 ♀♀; Mahya Hill (880 m): 07.06.2003, ♂; Vize-Kıyıköy (0 m): 26.08.1998, ♀; between Kıyıköy-Kömürköy (200 m): 16.06.2001, ♀; Tekirdağ: Center-Köseilyas (50 m): 02.08.1998, ♂; Malkara-Mahramlı (Cumhuriyet Ormanı) (230 m): 07.08.2001, 2 ♂♂; Saray (180 m): 16.06.2001, ♂; Sinanlı (105 m): 11.09.1997, 2 ♂♂; Şarköy-Emirali (200 m): 30.07.1998, ♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli (Fahringer 1922, Hoberlandt 1956, Lodos *et al.* 1978, Fent & Aktaç 1999, Şerban 2010, Fent 2011, Yazıcı *et al.* and Orçan & Kıvan 2017 as *G. lineatum*,).

Asian Türkiye: Adana, Adıyaman, Ağrı, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bayburt, Burdur, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Denizli, Düzce, Erzincan, Erzurum, Eskişehir, Gaziantep, Hatay, Iğdır, Isparta, İçel, İstanbul, İzmir, Kahramanmaraş, Karabük, Kars, Kastamonu, Kayseri, Konya, Kütahya, Manisa, Mersin, Muğla, Osmaniye, Sakarya, Sinop, Sivas, Tunceli, Yalova, Yozgat, Zonguldak (Horváth 1883, 1901, 1919, Puton & Noualhier 1895, Escherich 1897, Kiritshenko 1918, Fahringer 1922, Gadeau de Kerville 1939, Hoberlandt 1956, Wagner 1966, Lodos *et al.* 1978, 1998, Kıyak 1993, 2000, 2016, Önder *et al.* 1995, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Fent & Japoshvili 2012, Yazıcı *et al.* 2014, Küçükbasmacı & Kıyak 2015, Çerçi & Gözüaçık 2019 and Bulak & Yıldırım 2021 as *G. lineatum*).

General Distribution: Europe: Albania, Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Crete, Croatia, Czech Republic, Denmark, Estonia, European Kazakhstan, European Türkiye, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Macedonia, Moldavia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia (CT ST), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Georgia, Iran, Iraq, Israel, Kirgizia, Lebanon, Russia (ES WS), Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Note: Sequence comparison of mitochondrial gene COI confirms that *Graphosoma italicum* is a valid and distinct species from *Graphosoma lineatum* (Lupoli 2017). According to Lupoli (2017), the distribution of *G. lineatum* is limited to North Africa and Sicily. *Graphosoma italicum* is found elsewhere in Europe and the Middle East. Therefore, the records previously given as *G. lineatum* from Türkiye belong to *G. italicum*.

Graphosoma melanoxanthum Horváth, 1903

Asian Türkiye: Ankara, Diyarbakır, Elazığ, Erzurum, Iğdır, Kars, Yalova (Horváth. 1903b, 1908, Kiritshenko 1918, Hoberlandt 1956, Seidenstücker 1975, Lodos *et al.* 1978, Kıyak 1990, Külekçi *et al.* 2009, Yazıcı *et al.* 2014).

General Distribution: Europe: Albania. Asia: Azerbaijan, Armenia, Asian Türkiye, Georgia, Iran, Iraq.

Graphosoma semipunctatum (Fabricius, 1775)
= *Graphosoma creticum* Horváth, 1909

Material examined: Çanakkale: Eceabat-Alçıtepe (50 m): 08.06.2001, ♂; Gelibolu-Ilgardere (20 m): 08.06.2001, ♀, 3 ♂♂; Edirne: Balkan Campus (41 m): 23.07.2001, ♀; İpsala-Sultanköy (80 m): 17.07.1993, 4 ♀♀, 3 ♂♂; Lalapaşa-Hacıdanişment (500 m): 21.07.1993, 2 ♀♀, 5 ♂♂; Kırklareli: Üsküp-Kurudere (320 m): 27.06.2002, ♀, 3 ♂♂. Nevşehir: Göreme-Kızılçukur Valley, (1190 m), 31.08.2019, ♀, 5 ♂♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ (Fahringer 1922, Lodos *et al.* 1978 as *G. creticum*, Fent & Aktaç 1999, Fent 2011, Orçan & Kıvan 2017).

Asian Türkiye: Asia Minor (Horváth 1903b), Adana, Adıyaman, Artvin, Ankara, Antalya, Aydın, Balıkesir, Bursa, Çanakkale, Çorum, Denizli, Diyarbakır, Elazığ, Erzurum, Gaziantep, Hatay, Iğdır, İzmir, Kahramanmaraş, Karaman, Kars, Kastamonu, Kayseri, Konya, Manisa, Mardin, Muğla, Nevşehir, Osmaniye, Sakarya, Sivas, Şanlıurfa, Yozgat (Reuter 1890, Puton 1892, Horváth 1903b, 1909, 1919, Kiritshenko 1918, ,Fahringer 1922, Hoberlandt 1956, Linnavuori 1965, Wagner 1966, Lodos *et al.* 1978 as *G. creticum*, Lodos *et al.* 1998, Önder *et al.* 1983, 1995 as *G. creticum*, Kıyak 1993, Özsaraç & Kıyak 2001, Özsaraç *et al.* 2001, Kıyak *et al.* 2004, Bolu *et al.* 2006, Külekçi *et al.* 2009, Fent 2010, Şerban 2010, Gözüaçık *et al.* 2011, Tezcan *et al.* 2013, Matocq *et al.* 2014, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Türkiye, France, Greece, Italy, Macedonia, Montenegro, Portugal,

Romania, Russia (ST: Caucasus), Serbia, Slovenia, Spain, Switzerland, Ukraine. North Africa: Algeria, Libya, Morocco, Tunisia. Asia: Afghanistan?, Armenia, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Syria, Turkmenistan.

Graphosoma stali Horváth, 1881

Asian Türkiye: Asia Minor (Horváth 1881 as *G. lineatum* var. *stali*), Adıyaman, Diyarbakır, Elazığ, Gaziantep, Hatay, Kars, Mardin, Muş (Puton 1896, Horváth 1903b, 1908, Kiritshenko 1924, Wagner 1959, Seidenstücker 1975, Önder *et al.* 1995, Özgen *et al.* 2005b, Yazıcı *et al.* 2014).

General Distribution: Asia: Asian Türkiye, Iran, Iraq, Israel, Syria.

Subgenus *Graphosomella* Carapezza & Jindra
Graphosoma inexpectatum Carapezza & Jindra, 2008

Asian Türkiye: Adana, Elazığ, Gaziantep, Van (Fent *et al.* 2013, Kemal *et. al*. 2013, Çerçi *et al.* 2018).

General Distribution: Asia: Asian Türkiye, Syria.

Genus *Leprosoma* Baerensprung
Leprosoma inconspicuum Baerensprung, 1859

Asian Türkiye: Ankara (Hoberlandt 1956, Seidenstücker 1960 as *L. carinatum*, Péricart 2010).

General Distribution: Europe: Albania, Bulgaria, European Kazakhstan, France, Greece, Italy, Macedonia, Moldavia, Portugal, Romania, Russia (ST), Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Georgia, Iran, Iraq, Kirgizia, Russia (WS).

Leprosoma reticulatum (Herrich-Schaeffer, 1851)

Asian Türkiye: Niğde, Eskişehir (Seidenstücker 1957, Péricart 2010).

General Distribution: North Africa: Egypt, Libya, Morocco. Asia: Afghanistan, Asian Türkiye, Iran, Israel, Syria. Extralimital: Mauritania.

Leprosoma stali Douglas & Scott, 1868

European Türkiye: Tekirdağ (Lodos *et al.* 1978, Önder *et al.* 2006).

Asian Türkiye: Adana, Diyarbakır, Gümüşhane, İzmir, Konya, Niğde (Seidenstücker 1957, 1960, Wagner 1959, Önder *et al.* 1995, 2006, Gapon 2008, Péricart 2010).

General Distribution: Europe: European Türkiye. North Africa: Egypt. Asia: Armenia, Asian Türkiye, Azerbaijan, Cyprus, Iran, Iraq, Israel, Jordan, Syria.

Leprosoma tuberculatum Jakovlev, 1874

Asian Türkiye: Adana, Eskişehir, Diyarbakır, Isparta, Kahramanmaraş, Kayseri, Konya, Niğde (Seidenstücker 1957 as *L. inaequale* and *L. tuberculatum*, Lodos *et al.* 1978, 1998, Önder *et al.* 2006 as *L. inaequale* and *L. tuberculatum*, Gözüaçık *et al.* 2011 as *L. inaequale*, Kıyak 2016).

General Distribution: Europe: European Kazakhstan, Russia (ST). Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Iran, Israel, Jordan, Kirgizia, Syria, Uzbekistan.

Genus *Putonia* Stål
Putonia asiatica Jakovlev, 1885

Asian Türkiye: Iğdır (Yazıcı *et al.* 2014).

General Distribution: Europe: European Kazakhstan. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Iran, Kirgizia, Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Pakistan.

Genus *Tholagmus* Stål
Tholagmus flavolineatus (Fabricius, 1798)

Material examined: Edirne: Lalapaşa-Ömeroba (310 m): 02.08.2000, ♂; Hatay: Hassa, Aktepe, (213m), 20.5.2010, 4♀♀ 4♂♂; İstanbul: Çatalca- Ömerli (80 m): 15.06.2001, ♀; Kırklareli: Ürünlü (60 m): 21.08.1992, ♀; Lüleburgaz-Ceylanköy (70 m): 26.08.1998, ♀; Tekirdağ: Center-Oruçbeyli (200 m): 07.08.2001, ♀, ♂; Kaşıkçı (190 m): 26.08.1992, ♂; Malkara-Hasköy (250 m): 26.09.1992, ♂; Izgar Village (200 m): 28.07.1998, ♀; Mahramlı (230 m): 30.07.1998, ♂; Danişment (Korudağı) (250 m): 15.09.2001, ♀, ♂; Şarköy (0 m): 30.07.1998, ♂; Muratlı (50 m): 26.08.1992, ♂.

European Türkiye: Çanakkale, Edirne, İstanbul, Kırklareli (Hoberlandt 1956, Linnavuori 1965, Lodos *et al.* 1978, Josifov 1986, Fent & Aktaç 1999, Şerban 2010).

Asian Türkiye: Adana, Adıyaman, Ankara, Antalya, Artvin, Balıkesir, Bursa, Burdur, Çanakkale, Denizli, Diyarbakır, Elazığ, Erzurum, Gaziantep, Hatay, Iğdır, İçel, İzmir, Kahramanmaraş, Kars, Kayseri, Konya, Osmaniye, Sinop (Horváth 1905, Kiritshenko 1918, Gadeau de Kerville 1939, Hoberlandt 1956, Wagner 1966, Lodos *et al.* 1978, 1998, Önder *et al.* 1995, Özsaraç *et al.* 2001, Fent 2010, Péricart 2010, Şerban 2010, ,Gözüaçık *et al.* 2011, Özgen 2012, Yazıcı *et al.* 2014, Çerçi & Gözüaçık 2019).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, Croatia, European Kazakhstan, European Türkiye, France, Greece, Italy, Macedonia, Montenegro, Portugal, Romania, Russia (ST), Serbia, Slovenia, Spain, Ukraine. North Africa: Algeria, Egypt, Libya, Morocco, Tunisia. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Cyprus, Georgia, Iran, Iraq, Israel, Lebanon, Mongolia. Extralimital: Pakistan.

Genus *Tshingisella* Kiritshenko
Tshingisella bella Kiritshenko, 1913

Asian Türkiye: Adana, Niğde (Seidenstücker 1957, Péricart 2010).

General Distribution: Asia: Armenia, Asian Türkiye, Azerbaijan, Iran, Iraq, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Genus *Ventocoris* Hahn
Subgenus *Ventocoris* Hahn
Ventocoris horvathi (Puton, 1896)

Asian Türkiye: Adana, Diyarbakır, Elazığ, Gaziantep, Hatay, Malatya, Mardin, Şanlıurfa, Şırnak, Tunceli (Puton 1896, Seidenstücker 1958, Wagner 1959, Önder *et al.* 1995, 2006, Lodos *et al.* 1998, Özgen *et al.* 2005b, Gözüaçık *et al.* 2011, Dursun & Fent 2013).

General Distribution: Europe: Russia (ST). Asia: Armenia, Asian Türkiye, Iran, Iraq, Syria.

Ventocoris rusticus (Fabricius, 1781)
=*Ventocoris trigonus* (Krynicki, 1871)

Material examined: Çanakkale: Gelibolu-Süleymaniye (50 m): 30.07.1998, ♀, ♂; Kırklareli: Çukurpınar (500 m): 25.08.1998, ♂; Kofçaz-between İnece-Paşayeri (95 m): 02.08.2000, ♀; Tekirdağ: Hayrabolu-Dambaslar (110 m): 16.08.1997, 2 ♀♀, ♂; Malkara-Izgar Village (200 m): 28.07.1998, ♀; Şarköy-Emirali (200 m): 30.07.1998, ♀.

European Türkiye: Edirne (Hoberlandt 1956, Fent & Aktaç 1999, Şerban 2010, Dursun & Fent 2013).

Asian Türkiye: Adana, Afyonkarahisar, Amasya, Ankara, Artvin, Aydın, Balıkesir, Burdur, Bursa, Çanakkale, Elazığ, Gaziantep, Hatay, Isparta, Kahramanmaraş, Kayseri, Konya, Malatya, Nevşehir, Niğde, Sivas, Dursun (Horváth 1889, 1901, 1919, Puton 1892, Escherich 1897, Fahringer 1922, Linnavuori 1954, Hoberlandt 1956, Lodos et *al.* 1978, 1998, Önder *et al.* 1995, Özsaraç *et al.* 2001, Özsaraç & Kıyak 2001, Kıyak *et al.* 2004, Şerban 2010, Dursun & Fent 2013, Yazıcı *et al.* 2014, Kıyak 2016, Çerçi *et al.* 2018, Özgen & Dioli 2018).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Croatia, European Kazakhstan, European Türkiye, France, Greece, Hungary, Italy, Malta, Macedonia, Moldavia, Montenegro, Portugal, Romania, Russia (ST), Serbia, Sicily, Slovakia, Slovenia, Spain, Ukraine. North Africa: Algeria, Libya, Morocco, Tunisia. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Kirgizia, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Note: Except Dursun & Fent (2013) and Yazıcı *et al.* (2014), all researchers gave this species as *V. trigonus*. *V. trigonus* is synonymous with *V. rusticus* by Dursun & Fent (2013).

Subgenus *Astirocoris* Jakovlev
Ventocoris achivus (Horváth, 1889)

Asian Türkiye: İzmir (Horváth 1917 as *V. falcatus achivus*), Adana (Seidenstücker 1960 as *V. falcatus achivus*), Şanlıurfa (Önder *et al.* 1995 as *V. falcatus*), Osmaniye (Lodos *et al.* 1998 *as V. falcatus*), Diyarbakır (Gözüaçık *et al.* 2011 as *V. falcatus*), Adana, Hatay, Aydın, Manisa (Dursun & Fent 2013), Muğla (Tezcan *et al.* 2013, Yazıcı *et al.* 2014).

General Distribution: Europe: Crete, Greece. North Africa: Egypt. Asia: Asian Türkiye, Azerbaijan, Cyprus, Iran, Iraq, Israel, Jordan, Sinai, Syria.

Ventocoris armeniacus (Kiritshenko, 1938)

Asian Türkiye: Niğde, Kahramanmaraş, Şanlıurfa (Seidenstücker 1960, Lodos *et al.* 1998, Dursun & Fent 2013).

General Distribution: Asia: Armenia, Asian Türkiye, Azerbaijan, Iran.

Ventocoris bulbifer Seidenstücker, 1964

Asian Türkiye: Aydın, Denizli, Giresun, Iğdır, Konya, Muğla, Niğde (Seidenstücker 1964, Lodos *et al.* 1978, Péricart 2010, Dursun & Fent 2013, Çerçi & Gözüaçık 2019).

General Distribution: Asia: Armenia, Asian Türkiye, Azerbaijan, Iran.

Ventocoris fischeri (Herrich-Schaeffer, 1851)

Asian Türkiye: Adana, Amasya, Ankara, Antalya, Burdur, Çorum, Diyarbakır, Kahramanmaraş, Konya, Mersin, Nevşehir, Niğde (Horváth 1889, Hoberlandt 1956, Seidenstücker 1958, Wagner 1959, Lodos *et al.* 1978, 1998, Dursun 2004, Önder *et al.* 2006, Péricart 2010, Dursun & Fent 2013, Yazıcı *et al.* 2014).

General Distribution: Europe: France, Portugal? North Africa: Egypt. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Iran, Israel, Sinai, Syria, Tadzhikistan, Turkmenistan, Uzbekistan. Extralimital: Sudan.

Ventocoris halophilus (Jakovlev, 1874)

Asian Türkiye: Ağrı, Ankara, Erzurum, Eskişehir, Konya, Karaman, Kırşehir, Niğde, Van (Hoberlandt 1956, Seidenstücker 1960, Lodos *et al.*1998, Péricart 2010, Yazıcı *et al.* 2014).

General Distribution: European Kazakhstan, Russia (CT: Samara Prov. ST), Ukraine. Asia: Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW), Kirgizia, Russia (WS), Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Ventocoris oblongus (Horváth, 1889)

Asian Türkiye: Iğdır, Van (Dursun & Fent 2013, Çerçi & Gözüaçık 2019).

General Distribution: Asia: Armenia, Asian Türkiye, Azerbaijan, Iran.

Genus Vilpianus Stål
Vilpianus galii (Wolff, 1802)

Material examined: İstanbul: Çatalca-Danamandıra (150 m): 15.08.1998, ♀; Aydınlar (125 m): 28.08.1998, ♀; Durusu (110 m): 29.08.1998, ♀; Tekirdağ: Malkara-Izgar Village (200 m): 28.07.1998, 5 ♀♀, 3 ♂♂; Mahramlı (230 m): 30.07.1998, ♀.

European Türkiye: Edirne (Hoberlandt 1956, Josifov 1986, Fent & Aktaç 1999)

Asian Türkiye: Adana, Ankara, Diyarbakır, Elazığ, Gaziantep, Kahramanmaraş, Kastamonu (Önder *et al.* 1995, Lodos *et al.* 1998, Kıyak & Ün 1999, Fent 2010, Gözüaçık *et al.* 2011, Özgen & Dioli 2018).

General Distribution: Europe: Albania, Austria, Bosnia Hercegovina, Bulgaria, Croatia, Czech Republic, Kazakhstan, European Türkiye, France, Greece, Hungary, Italy, Macedonia, Moldavia, Portugal, Romania, Russia (CT: Samara Prov. ST), Serbia, Slovakia, Slovenia, Spain, Ukraine. North Africa: Algeria. Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Cyprus, Iran, Kirgizia, Syria, Turkmenistan, Uzbekistan.

Tribe PODOPINI Amyot & Serville
Genus *Podops* Laporte
Subgenus *Podops* Laporte
Podops inunctus (Fabricius, 1775)

European Türkiye: İstanbul (Fent & Aktaç 2007b).

General Distribution: Europe: Austria, Belgium, Bosnia Hercegovina, Bulgaria, Belarus, Croatia, Czech Republic, Denmark, European Türkiye, France, Great Britain, Germany, Hungary, Italy, Latvia?, Lithuania, Luxembourg, Macedonia, Moldavia, Netherlands, Poland, Portugal, Romania, Russia (CT: Kaliningrad Prov.), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine. North Africa: Algeria, Morocco.

Subgenus *Opocrates* Horváth
Podops rectidens Horváth, 1883

European Türkiye: Edirne, İstanbul, Tekirdağ (Yazıcı *et al.* 2014, Fent & Dursun 2016).

Asian Türkiye: Anatolia (Rider 2006), Kastamonu (Fent 2010).

General Distribution: Europe: Albania, Bosnia Hercegovina, Bulgaria, Crete, European Türkiye, Greece, Hungary, Romania, Russia (ST), Serbia, Ukraine. Asia: Asian Türkiye, Azerbaijan, Cyprus, Georgia, Syria.

Tribe TARISINI Stål
Genus *Tarisa* Amyot & Serville
Tarisa elevata Reuter, 1901

Asian Türkiye: Iğdır (Çerçi & Gözüaçık 2019).

General Distribution: Europe: European Kazakhstan, Russia (ST). Asia: Afghanistan, Asian Kazakhstan, Asian Türkiye, China (NW), Iran, Kirgizia, Mongolia, Tadzhikistan, Turkmenistan, Uzbekistan.

Tarisa igdirensis Lodos & Önder, 1978

Asian Türkiye: Ağrı, Bingöl, Çorum, Kars (Lodos & Önder 1978, Lodos *et al.* 1998, Önder *et al.* 2006, Péricart 2010).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia.

Tarisa osmanica Hoberlandt, 1956

Asian Türkiye: Ağrı, Ankara, Antalya, Elazığ, Kahramanmaraş, Kayseri, Kırıkkale, Kırşehir, Nevşehir, Van, Yozgat (Hoberlandt 1956, Lodos & Önder 1978, Lodos *et al.* 1998, Önder *et al.* 2006).

General Distribution: Asia: Asian Türkiye.

Note: This species is endemic to Anatolia.

Tarisa subspinosa subspinosa (Germar, 1839)
= *Tarisa fraudatrix* Horváth, 1891

Asian Türkiye: Ağrı, Aydın, Aksaray, Diyarbakır, Erzincan, Iğdır, Kars, Kahramanmaraş, Niğde (Horváth 1894, Reuter 1900, Kiritshenko 1918, Linnavuori 1954, 1965, Lodos & Önder 1978, Lodos *et al.* 1998).

General Distribution: Europe: Kazakhstan, Russia (ST), Ukraine. North Africa: Algeria, Egypt. Asia: Afghanistan, Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, China (NW WP), Georgia, Iran, Iraq, Kirgizia, Kuwait, Lebanon, Mongolia, Saudi Arabia, Sinai, Syria, Tadzhikistan, Turkmenistan, Uzbekistan, Yemen. Extralimital: India, Pakistan.

Note: This species is given by all authors as *Tarisa fraudatrix* in Türkiye.

Tarisa virescens Herrich-Schaeffer, 1851

Asian Türkiye: Asia Minor (Reuter 1890, 1901), Ankara, Burdur, Denizli, Elazığ, Erzincan, Gaziantep, Iğdır, Isparta, Kayseri, Kırşehir, Kütahya, Malatya, Nevşehir (Horváth 1905, Hoberlandt 1956, Lodos & Önder 1978, Lodos *et al.* 1978, 1998, Önder *et al.* 1995, Şerban 2010 as *T. flavescens*, Yazıcı *et al.* 2014, Özgen *et al.* 2021).

General Distribution: Europe: Russia (ST: Dagestan). Asia: Armenia, Asian Kazakhstan, Asian Türkiye, Azerbaijan, Iran, Iraq, Israel, Kirgizia, Lebanon, Syria, Tadzhikistan, Turkmenistan, Uzbekistan.

Records in need of confirmation

Subfamily ASOPINAE Amyot & Serville
Genus *Picromerus* Amyot & Serville
Picromerus nigridens (Fabricius, 1803)

Türkiye. Fieber (1861), Hoberlandt (1956), Péricart (2010).

General Distribution: Europe: Albania, Crete, Croatia, European Türkiye?, France, Greece, Italy, Portugal, Spain, Switzerland. North Africa: Algeria, Morocco, Tunisia.

Note: Hoberlandt (1956) and Péricart (2010) based the distribution of this species in Türkiye on Fieber (1861). Fieber (1861), however, cited it without locality. No other records are available so far.

Subfamily PENTATOMINAE Leach
Tribe SCIOCORINI Amyot & Serville
Genus *Menaccarus* Amyot & Serville
Menaccarus dohrnianus (Mulsant & Rey, 1866)

Asian Türkiye: Rider (2006), Aukema (2020).

General Distribution: Europe: Italy. North Africa: Algeria, Canary Islands, Egypt, Libya, Morocco, Tunisia.

Asia: Asian Türkiye?, Azerbaijan?, Iran, Israel, Saudi Arabia, Sinai, Syria.

Note: Derjhansky & Péricart (2005) and Ghahari *et al.* (2014) do not mention Türkiye in the distribution of this species and no Turkish records have been found so far.

Subfamily PHYLLOCEPHALINAE Amyot & Serville
Tribe PHYLLOCEPHALINI Amyot & Serville
Genus *Schyzops* Spinola
Schyzops aegyptiaca aegyptiaca (Lefebvre, 1831)

Türkiye. Fieber (1861).

General Distribution: Europe: France, Italy. North Africa: Algeria, Egypt, Libya. Asia: Afghanistan, Asian Türkiye?, Iran, Israel, Qatar, Saudi Arabia, Syria, Yemen. Extralimital: Sudan, Uganda.

Note: This species was given in Fieber (1861) without a specific locality record during the Ottoman Empire, and no other records from Türkiye were published (Derjhanshi & Péricart 2005). Ghahari *et al.* (2014) mention Türkiye in the distribution based on Hoberlandt & Safavi (1981). But probably all citations from Türkiye are based on Fieber (1861).

Subfamily PODOPINAE Amyot & Serville
Tribe GRAPHOSOMATINI Mulsant & Rey
Genus *Sternodontus* Mulsant & Rey
Sternodontus ampliatus Jakovlev, 1887

Asian Türkiye: Asia Minor (Péricart 2010).

General Distribution: Asia: Asian Türkiye?, Azerbaijan, Iran, Kirgizia, Tadzhikistan, Turkmenistan, Uzbekistan.

Note: The source of the record in Péricart (2010) is unknown. Its occurrence in Türkiye needs to be confirmed.

Species excluded from the Turkish list

Subfamily PENTATOMINAE Leach
Tribe STRACHIINI Mulsant & Rey
Genus *Eurydema* Laporte
Eurydema eckerleini Josifov, 1961

General Distribution: Europe: Greece (Crete).

Note: *E. eckerleini* was also reported from Asian Türkiye by Heckman *et al.* (2015) and Aukema (2020) based on Derjanschi & Péricart (2005). However, Derjanschi & Péricart (2005) only report that this species is endemic to the island of Crete, and the record in the Peloponnese Peninsula of Greece is also questionable. In addition, in the literature review conducted for this study, no known records of this species from Türkiye have been found so far.

Eurydema mrugowskyi Stichel, 1944

Asian Türkiye: Hoberlandt (1956: misidentification).

General Distribution: Asia: Afghanistan. Extralimital: Pakistan.

Note: Hoberlandt (1956) recorded this species from the Asian part of Türkiye (Abacılar in Adana province). However, Kment & Jindra (2008) re-examined Hoberlandt's specimens at the National Museum Prague (NMPC), revealing that they had been misidentified and actually belonged to *E. spectabilis* Horváth, 1882. Since there appear to be no other records of *E. mrugowskyi* from Türkiye the species is removed from the list.

Discussion

In Türkiye, the Pentatomidae family is important both for agriculturalists, forest engineers and biologists in that it contains a number of agricultural pest species as well as some predatory species - belonging to Asopinae subfamily - which have the potential to control pests. So, many studies have been conducted on this group. As a result of the review of the studies carried out from the end of the 1800s to the present, 13 tribes, 61 genera and 174 species/subspecies (2 species only in European Türkiye, 97 species only in Asian Türkiye) belonging to 4 subfamilies of the Pentatomidae family of Türkiye were determined [Asopinae, 14 species belonging to 9 genera (in European Türkiye 10, in Asian Türkiye 13 species), Pentatominae, 10 tribes, 125 species belongin to 39 genera, Aeliini, 2 genera and 16 species (in European Türkiye 8, in Asian Türkiye 16), Cappaeini 1 genus and 1 species (in European Türkiye 1, in Asian Türkiye 1), Carpocorini, 16 genera and 39 species (in European Türkiye 17, in Asian Türkiye 39), Eysarcorini, 2 genera and 6 species (in European Türkiye 5, in Asian Türkiye 6), Halyini, 3 genera and 7 species (in European Türkiye 2, in Asian Türkiye 7), Mecideini, 1 genus and 1 species (only in Asian Türkiye), Pentatomini, 4 genera and 6 species (in European Türkiye 5, in Asian Türkiye 6), Piezodorini, 2 genera and 2 species (in European Türkiye 2, in Asian Türkiye 2), Sciocorini, 4 genera and 26 species (in European Türkiye 10, in Asian Türkiye 26), Strachiini, 4 genera and 21 species (in European Türkiye 7, in Asian Türkiye 21), Phyllocephalinae, 1 genus and 1 species (only in Asian Türkiye), Podopinae, 3 tribes and 34 species belonging to 12 genera, Graphosomatini, 10 genera and 27 species (in European Türkiye 8, in Asian Türkiye 27), Podopini, 1 genus and 2 species (in European Türkiye 2, in Asian Türkiye 1), Tarisini, 1 genus and 5 species (only in Asian Türkiye) (Table 1).

As a result of the identification of the samples collected in various localities in Anatolia and Thrace, (mainly in the Thrace Region) between the years 1991–2021 and 53 Pentatomid species were identified. Of these, 5 species belong to the subfamily Asopinae, 41 species to Pentatominae and 7 species to the Podopinae subfamily. In addition, *Pentatoma rufipes*, which is rarely seen in Anatolia, was recorded for the first time in the Thrace Region. *Rhacognatus punctatus*, which was found only as a single specimen in Edirne-Suakacağı Village, is a rare species. This species was previously only detected in Edirne-Keşan by Lodos *et al.* (1978). The finding in this study is the second record of the species in Thrace and Türkiye. *Arma custos*, *Picromerus conformis*, *P.*

pseudobidens, *Chlorochroa juniperina juniperina*, *Eysarcoris aeneus* and *Vilpianus galii* are rare species and only a few specimens of these species have been identified.

There are approximately 1350 species belonging to 469 genera belonging to the Heteroptera suborder from Türkiye, and the Pentatomidae family is the second family with the highest number of species, after the Miridae family, with 174 species/subspecies. Dursun & Fent (2017) determined the type locality of 237 Heteroptera species from Türkiye, which corresponds to 18% of Türkiye's Heteroptera fauna. In addition, 107 species and 4 subspecies are endemic to Türkiye (Dursun & Fent 2017). There are 37 species of Pentatomidae described from Türkiye. 15 of these species, *Agatharchus escalerae*, *A. ponticus*, *Enigmocoris fissiceps*, *Eurydema caligata*, *Graphosoma alkani*, *Mustha izmirensis*, *M. longispinis*, *Peribalus hoberlandti*, *Picromerus brachypterus*, *P. pseudobidens*, *Risibia verbasci*, *Sciocoris persimilis*, *S. ressli*, *Tarisa igdirensis*, and *T. osmanica* are also endemic species to Anatolia (Dursun & Fent 2017).

Pentatomidae species acting as agricultural pests in Türkiye, *Aelia* spp. (especially *A. rostrata* and *A. acuminata*) in cereals, *Nezara viridula* causing damage on bean, soybean, okra and tomatoes, *Eurydema* spp. causing damage on Brassicaceae (cabbage cauliflower) and *Palomena prasina*, which is one of the most important hazelnut pests especially in the Black Sea Region are subject of various studies on their biologies, population dynamics, and damage patterns (Awel 1977, Atalay & Çağlayan 1990, Memişoğlu *et al.* 1996, Awad 2000, Saruhan & Tuncer 2006, Karsavuran *et al.* 2012, 2013, Birgücü & Karsavuran 2013,). It is known that *Halyomorpha halys* which is native species to South East Asia but is an aggressive invasive species elsewhere and first detected in Europe in 2001 and in Türkiye in 2017, causes damage to 107 different annual and perennial plants and has the potential to cause damage to 300 different plants (Çerçi *et al.* 2021, Dursun 2021). *Perillus bioculatus*, another alien species belonging to the Asopinae subfamily of the Pentatomidae, naturally lives in North America. However, this species, which has an important role in the control of the potato beetle, was brought to Europe by man and released in nature, unlike other allien species. In Türkiye, it first spread to the Thrace Region and then to Anatolia (Kıvan 2004, Fent & Aktaç 2007b, Dursun & Fent 2018, Tarla & Tarla 2018, Kıyak *et al.* 2019, Dursun 2021).

When the Pentatomidae species are evaluated in terms of density, *Antheminia lunulata*, *Carpocoris mediterraneus mediterraneus*, *C. pudicus*, *C. purpureipennis*, *Codophila varia*, *Dolycoris baccarum*, *Palomena prasina*, *Staria lunata*, *Eysarcoris ventralis*, *Apodiphus amygdali*, *Mustha spinosula*, *Rhaphigaster nebulosa*, *Piezodorus lituratus*, *Eurydema oleracea*, *E. ornata*, Graphosoma italicum italicum are common species found in many localities in Thrace and Anatolia. T*roilus luridus*, *Rhacognathus punctatus*, *Aelia klugii*, *A. sibirica*, *Antheminia varicornis*, *Brachynema signatum*, *Chroantha ornatula*, Peribalus hoberlandti, *Palomena mursili*, *Risibia verbasci*, *M. longispinis*, *Mecidea lindbergi*, *Phaeocoris ellipticus ellipticus*, *Sciocoris umbrinus*, *S. orientalis*, *S. persimilis*, *Bagrada funerea*, *B. turcica*, *Eurydema caligata*, *E. dominulus*, *Graphosoma alkani*, *G. consimile*, *Leprosoma inconspicuum*, *L. reticulatum*, *Tshingisella bella*, *Podops inunctus* and *Tarisa elevata* were rare species detected in only one or two localities.

Türkiye records of *Schyzops aegyptiaca aegyptiaca*, *Sternodontus ampliatus*, *Picromerus nigridens* and *Menaccarus dohrnianus* were given in ancient times without a specific locality and later researchers repeated them. The existence of these species in Türkiye, which has not been recorded in further studies, needs to be confirmed.

In addition, two species, *Eurydema eckerleini* and *Eurydema mrugowskyi*, have been removed from the Turkish Pentatomidae list. *E. eckerleini* was given as endemic to the island of Crete, by Derjanschi & Péricart (2005), and no evidence of the distribution of this species in Türkiye was found. It was understood that *E. mrugowskyi*, whose records in Türkiye are based on Hoberlandt (1956), was misidentification as a result of the examination of the Turkish samples in the National Museum Prague (NMPC) and that the samples belonged to *Eurydema spectabile*.

In conclusion, an up-to-date checklist of the Turkish Pentatomidae fauna presented in this study will be a basis and guide for future studies. We hope it will be helpful to researchers as it provides a comprehensive and informative overview of all Pentatomidae species.

Table 1. Turkish Pentatomidae list of species/subspecies. The distributions that need to be confirmed are indicated with a "?". The new record for Thrace is indicated with "*". (ET: European Türkiye, AT: Asian Türkiye)

PENTATOMIDAE Leach, 1815		
ASOPINAE Amyot & Serville, 1843		
Andrallus spinidens (Fabricius, 1787)		AT
Arma custos (Fabricius, 1794)	ET	AT
Arma insperata Horváth, 1899		AT
Jalla dumosa (Linnaeus, 1758)	ET	AT
Perillus bioculatus (Fabricius, 1775)	ET	AT
Picromerus bidens (Linnaeus, 1758)	ET	AT
Picromerus brachypterus Ahmad & Önder, 1990	ET	AT

Table 1. Continued.

Picromerus conformis (Herrich-Schaeffer, 1841)	ET	AT
Picromerus nigridens (Fabricius, 1803)	?ET	
Picromerus pseudobidens Ahmad & Önder, 1990	ET	AT
Pinthaeus sanguinipes (Fabricius, 1781)		AT
Rhacognathus punctatus (Linnaeus, 1758)	ET	AT
Troilus luridus (Fabricius, 1775)		AT
Zicrona caerulea (Linnaeus, 1758)	ET	AT
PENTATOMINAE Leach, 1815		
AELIINI Douglas & Scott, 1865		
Aelia acuminata (Linnaeus, 1758)	ET	AT
Aelia albovittata Fieber, 1868	ET	AT
Aelia alticola Kiritshenko, 1914	ET	AT
Aelia furcula Fieber, 1868		AT
Aelia germari Küster, 1852		AT
Aelia klugii Hahn, 1833		AT
Aelia melanota Fieber, 1868		AT
Aelia notata Rey, 1887		AT
Aelia rostrata Boheman, 1852	ET	AT
Aelia sibirica Reuter, 1884		AT
Aelia virgata (Herrich-Schaeffer, 1841)	ET	AT
Neottiglossa bifida (A. Costa, 1847)	ET	AT
Neottiglossa flavomarginata (Lucas, 1849)		AT
Neottiglossa leporina (Herrich-Schaeffer, 1830)	ET	AT
Neottiglossa lineolata (Mulsant & Rey, 1852)	ET	AT
Neottiglossa pusilla (Gmelin, 1790)		AT
CAPPAEINI Atkinson, 1888		
Halyomorpha halys (Stål,1855)	ET	AT
CARPOCORINI Mulsant & Rey, 1866		
Agatharchus escalerae Horváth, 1901		AT
Agatharchus herrichii (Kolenati, 1846)		AT
Agatharchus linea (Klug, 1845)		AT
Agatharchus ponticus Belousova, 1999		AT
Agatharchus tritaenia Horváth, 1897		AT
Antheminia lunulata (Goeze, 1778)	ET	AT
Antheminia pusio pusio (Kolenati, 1846)	ET	AT
Antheminia varicornis (Jakovlev, 1874)		AT
Brachynema cinctum (Fabricius, 1775)		AT
Brachynema germarii (Kolenati, 1846)		AT
Brachynema signatum Jakovlev, 1879		AT
Carpocoris coreanus Distant, 1899		AT
Carpocoris fuscispinus (Boheman, 1851)		AT
Carpocoris mediterraneus mediterraneus Tamanini, 1958	ET	AT
Carpocoris melanocerus (Mulsant & Rey, 1852)	ET	AT
Carpocoris pudicus (Poda, 1761)	ET	AT
Carpocoris purpureipennis (De Geer, 1773)	ET	AT
Chlorochroa juniperina juniperina (Linnaeus, 1758)		AT
Chlorochroa pinicola (Mulsant & Rey, 1852)		AT
Chroantha ornatula (Herrich-Schaeffer, 1842)		AT
Cnephosa flavomarginata Jakovlev, 1880		AT
Codophila maculicollis (Dallas, 1851)		AT
Codophila varia varia (Fabricius, 1787)	ET	AT
Dolycoris baccarum (Linnaeus, 1758)	ET	AT
Enigmocoris fissiceps (Horváth, 1906)		AT
Holcogaster fibulata (Germar, 1831)	ET	AT
Holcostethus albipes (Fabricius, 1781)	ET	AT
Holcostethus sphacelatus (Fabricius, 1794)	ET	AT
Peribalus hoberlandti Lodos & Önder, 1980		AT
Peribalus inclusus (Dohrn, 1860)	ET	AT
Peribalus strictus strictus (Fabricius, 1803)	ET	AT
Peribalus strictus vernalis (Wolff, 1804)	ET	AT
Palomena mursili Linnavuori, 1984		AT
Palomena prasina (Linnaeus, 1761)	ET	AT
Palomena viridissima (Poda, 1761)	ET	AT

Table 1. Continued.

Rhombocoris regularis (Herrich-Schaeffer, 1851)		AT
Risibia christophi (Jakovlev, 1886)		AT
Risibia verbasci Lodos & Önder, 1980		AT
Staria lunata (Hahn, 1835)	ET	AT
EYSARCORINI Mulsant & Rey, 1866		
Eysarcoris aeneus (Scopoli, 1763)	ET	AT
Eysarcoris ventralis (Westwood, 1837)	ET	AT
Stagonomus amoenus (Brullé, 1832)	ET	AT
Stagonomus bipunctatus (Linnaeus, 1758)	ET	AT
Stagonomus devius Seidenstücker, 1965		AT
Stagonomus venustissimus (Schrank, 1776)	ET	AT
HALYINI Amyot & Serville, 1843		
Apodiphus amygdali (Germar, 1817)	ET	AT
Apodiphus integriceps Horváth, 1888		AT
Carenoplistus acutus (Signoret, 1880)		AT
Mustha izmirensis Memon & Ahmad, 2008		AT
Mustha longispinis Reuter, 1890		AT
Mustha spinosula (Lefebvre, 1831)	ET	AT
Mustha vicina Hoberlandt, 1997		AT
MECIDEINI Distant, 1902		
Mecidea lindbergi Wagner, 1954		AT
PENTATOMINI Leach, 1815		
Acrosternum breviceps (Jakovlev, 1889)		AT
Acrosternum heegeri Fieber, 1861	ET	AT
Acrosternum millierei (Mulsant & Rey, 1866)	ET	AT
Nezara viridula (Linnaeus, 1758)	ET	AT
Pentatoma rufipes (Linnaeus, 1758)	*ET	AT
Rhaphigaster nebulosa (Poda, 1761)	ET	AT
PIEZODORINI Atkinson, 1888		
Pausias martini (Puton, 1890)	ET	AT
Piezodorus lituratus (Fabricius, 1794)	ET	AT
SCIOCORINI Amyot & Serville, 1843		
Dyroderes umbraculatus (Fabricius, 1775)	ET	AT
Menaccarus arenicola (Scholtz, 1847)		AT
Menaccarus dohrnianus (Mulsant & Rey, 1866)		?AT
Phaeocoris ellipticus ellipticus (Herrich-Schaeffer, 1840)		AT
Sciocoris atifi Lodos & Önder, 1982		AT
Sciocoris capitatus Jakovlev, 1882		AT
Sciocoris convexiusculus Puton, 1874		AT
Sciocoris cursitans cursitans (Fabricius, 1794)	ET	AT
Sciocoris deltocephalus Fieber, 1861	ET	AT
Sciocoris distinctus Fieber, 1851	ET	AT
Sciocoris helferii Fieber, 1851	ET	AT
Sciocoris hoberlandti Wagner, 1954		AT
Sciocoris homalonotus Fieber, 1851	ET	AT
Sciocoris luteolus Fieber, 1861	ET	AT
Sciocoris macrocephalus Fieber, 1851	ET	AT
Sciocoris maculatus Fieber, 1851	ET	AT
Sciocoris microphthalmus Flor, 1860		AT
Sciocoris ochraceus Fieber, 1861		AT
Sciocoris ogivus Jakovlev, 1894		AT
Sciocoris orientalis Linnavuori, 1960		AT
Sciocoris pallens Klug, 1845		AT
Sciocoris persimilis Wagner, 1965		AT
Sciocoris pictus Wagner, 1959		AT
Sciocoris ressli Wagner, 1966		AT
Sciocoris sulcatus Fieber, 1851	ET	AT
Sciocoris umbrinus (Wolff, 1804)		AT
STRACHIINI Mulsant & Rey, 1866		
Bagrada abeillei Puton, 1881		AT
Bagrada amoenula (Walker, 1870)		AT
Bagrada concinna Horváth, 1936		AT

Table 1. Continued.

Bagrada funerea Horváth, 1901		AT
Bagrada kaufmanni (Oshanin, 1871)		AT
Bagrada stolida (Herrich-Schaeffer, 1839)		AT
Bagrada turcica Horváth, 1936		AT
Eurydema blanda Horváth, 1903	ET	AT
Eurydema caligata Horváth, 1901		AT
Eurydema dominulus (Scopoli, 1763)		AT
Eurydema fieberi Fieber, 1837		AT
Eurydema laticollis Horváth, 1907		AT
Eurydema oleracea (Linnaeus, 1758)	ET	AT
Eurydema ornata (Linnaeus, 1758)	ET	AT
Eurydema putoni (Jakovlev, 1877)		AT
Eurydema rugulosa (Dohrn, 1860)	ET	AT
Eurydema spectabilis Horváth, 1882	ET	AT
Eurydema ventralis Kolenati, 1846	ET	AT
Stenozygum coloratum (Klug, 1845)		AT
Trochiscocoris hemipterus (Jakovlev, 1879)		AT
Trochiscocoris rotundatus rotundatus Horváth, 1895	ET	AT
PHYLLOCEPHALINAE Amyot & Serville, 1843		
Schyzops aegyptiaca aegyptiaca (Lefebvre, 1831)		?AT
PODOPINAE Amyot & Serville, 1843		
GRAPHOSOMATINI Mulsant & Rey, 1865		
Ancyrosoma leucogrammes (Gmelin, 1790)	ET	AT
Derula delagrangei Puton, 1892		AT
Derula flavoguttata Mulsant & Rey, 1856	ET	AT
Graphosoma alkani Lodos, 1959		AT
Graphosoma consimile Horváth, 1903		AT
Graphosoma inexpectatum Carapezza & Jindra, 2008		AT
Graphosoma italicum italicum (O.F. Müller, 1766)	ET	AT
Graphosoma melanoxanthum Horváth, 1903		AT
Graphosoma semipunctatum (Fabricius, 1775)	ET	AT
Graphosoma stali Horváth, 1881		AT
Leprosoma inconspicuum Baerensprung, 1859		AT
Leprosoma reticulatum (Herrich-Schaeffer, 1851		AT
Leprosoma stali Douglas & Scott, 1868	ET	AT
Leprosoma tuberculatum Jakovlev, 1874		AT
Putonia asiatica Jakovlev, 1885		AT
Sternodontus ampliatus Jakovlev, 1887		?AT
Tholagmus flavolineatus (Fabricius, 1798)	ET	AT
Tshingisella bella Kiritshenko, 1913		AT
Ventocoris achivus (Horváth, 1889)		AT
Ventocoris armeniacus (Kiritshenko, 1938)		AT
Ventocoris bulbifer Seidenstücker, 1964		AT
Ventocoris fischeri (Herrich-Schaeffer, 1851)		AT
Ventocoris halophilus (Jakovlev, 1874)		AT
Ventocoris horvathi (Puton, 1896)		AT
Ventocoris oblongus (Horváth, 1889)		AT
Ventocoris rusticus (Fabricius, 1781)	ET	AT
Vilpianus galii (Wolff, 1802)	ET	AT
PODOPINI Amyot & Serville, 1843		
Podops inunctus (Fabricius, 1775)	ET	
Podops rectidens Horváth, 1883	ET	AT
TARISINI Stål, 1872		
Tarisa elevata Reuter, 1901		AT
Tarisa igdirensis Lodos & Önder, 1978		AT
Tarisa osmanica Hoberlandt, 1956		AT
Tarisa subspinosa subspinosa (Germar, 1839)		AT
Tarisa virescens Herrich-Schaeffer, 1851		AT
TOTAL	**77**	**172**

Acknowledgement

We are very grateful to Prof. Dr. Volkan AKSOY (Edirne, TÜRKİYE) for spelling corrections in English.

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Author Contributions: All authors contributed equally to this manuscript in its all stages.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study has received no financial support.

References

1. Ahmad, L & Önder, F. 1990a. Revision of the genus *Arma* Hahn (Hemiptera: Pentatomidae: Asopini) with description of two new species from Turkey. *Turkish Journal of Entomology,* 14: 3-12.
2. Ahmad, I. & Önder, F. 1990b. Revision of the genus *Picromerus* Amyot & Serville [Asopini-Pentatominae Pentatomidae (Heteroptera)] from western Palaearctic with description of two new species from Turkey. *Turkish Journal of Entomology*, 14: 75-84.
3. Ak, K., Uluca, M., Aydın, Ö. & Göktürk, T. 2019. Important invasive species and its pest status in Turkey: *Halyomorpha halys* (Stål) (Heteroptera: Pentatomidae). *Journal of Plant Diseases and Protection*, 126: 401-408.
4. Akıncı, Z.E. & Avcı, M. 2016. *Neodiprion sertifer*'in Göller Bölgesi ormanlarında biyolojisi ve doğal düşmanları. *Turkish Journal of Forestry*, 17(1): 30-36.
5. Anonymous, 2022. https://tr.wikipedia.org/wiki/Türkiye (Accessed on – 22.04.2022).
6. Atalay, R. & Çağlayan, L. 1990. Investigations on the population-injury relationships of *Eurydema ornatum* L. (Heteroptera, Pentatomidae) which harmful on cabbage and cauliflower seedlings. *Turkish Journal of Entomology*, 14(2): 109-114.
7. Aukema, B. 2020. Catalogue of Palaearctic Heteroptera. Naturalis Biodiversity Center. Available from https://catpalhet. linnaeus.naturalis.nl/ (Date accessed: 30.04.2022).
8. Aukema, B., Rieger, Ch. & Rabitsch, W. 2013. *Catalogue of the Heteroptera of the Palaearctic Region 6: Supplement*. The Netherlands Entomological Society, Amsterdam, 653 pp.
9. Awad, T.I. 2000. Türkiye *Carpocorini* (Heteroptera: Pentatomidae: Pentatominae) Türleri Üzerinde Sistematik ve Faunistik Araştırmalar. *.Phd Thesis, Ege University, Institue* of *Natural and Applied Sciences,* İzmir/ Bornova, 171 pp.
10. Awel, M.M. 1977. Türkiye'de bulunan önemli *Aelia* F. (Heteroptera: Pentatomidae) türlerinin taksonomik karakterleri ve bunlardan Ege Bölgesi'nde yaygın olarak bulunan *Aelia acuminata* L.'nın biyolojisi ve doğal düşmanları üzerinde araştırmalar *Phd Thesis, Ege University, Institue* of *Natural and Applied Sciences,* İzmir/ Bornova, 98 pp.
11. Belousova, E.N. 1999. Revision of shield bugs of the genus *Agatharchus* Stål (Heteroptera, Pentatomidae). *Entomologicheskoe Obozrenie*, 78: 828-848. [in Russian].
12. Belousova, E.N. 2007. Revision of the shield-bug genera *Holcostethus* Fieber and *Peribalus* Mulsant et Rey (Heteroptera, Pentatomidae) of the Palaearctic Region. *Entomologicheskoe Obozrenie*, 86(3): 610-654.
13. Birgücü, A.K. & Karsavuran, Y. 2013. *Nezara* viridula (L.) (Hemiptera: Pentatomidae)'nın fasulye baklasındaki beslenme davranışı. *Turkish Journal of Entomology*, 37(3): 343-358.
14. Bolu, H., Özgen, I. & Fent, M. 2006. Diyarbakır, Elazığ ve Mardin İlleri badem ağaçlarında bulunan Pentatomidae (Heteroptera) türleri. *Tarım Bilimleri Dergisi*, 16(1): 25-28.
15. Bulak, G. & Yıldırım E. 2021. Contribution to the knowledge of Alydidae, Coreidae, Rhopalidae and Pentatomidae (Hemiptera) fauna from fruit orchards in Iğdır Province of Turkey. *Munis Entomology & Zoology*, 16(2): 947-952.
16. Çerçi, B. 2021. First record of *Halyomorpha halys* (Stål, 1855) (Pentatomidae: Heteroptera) in Aegean Region of Turkey. *Acta Biologica Turcica*, 34(1): 35-37.
17. Çerçi, B. & Gözüaçık, G. 2019. Contribution to Pentatomoidea (Heteroptera) fauna of Iğdır and İstanbul with three new records for Turkish fauna. *Journal of the Heteroptera of Turkey*, 1(1-2): 33-40.
18. Çerçi, B., Karataş, A. & Karataş, A. 2021. Insecta non gratae: New distribution records of eight alien bug (Hemiptera) species in Turkey with contributions of citizen science. *Zootaxa*, 5057(1): 1-28.
19. Çerçi, B. & Koçak, Ö. 2017. Further contribution to the Heteroptera (Hemiptera) fauna of Turkey with a new synonymy. *Acta Biologica Turcica,* 30: 121-127.
20. Çerçi, B., Özgen, İ. & Dioli, P. 2018. Additional faunistic notes on Heteroptera (Hemiptera: Insecta) in East Anatolia (Turkey)**.** *Journal of Entomology and Zoology Studies*, 6(1): 1225-1231.
21. Çerçi, B. & Özgen İ. 2021. Contribution to the knowledge of Heteroptera (Hemiptera) fauna of Elazığ province with a new record for the fauna of Turkey. *Journal of the Heteroptera of Turkey*, 3(1): 50-75.
22. Çıtırıkkaya, B., Fent, M., Tezcan, S. & Gülperçin, N. 2015. Heteroptera species (Hemiptera) collected by pheromone traps of *Rhynchophorus ferrugineus* (Olivier 1790) (Coleoptera: Dryophthoridae) in İzmir province of Turkey. *Entomofauna Zeitschrifft für Entom*ologie, 36(14): 201-208.
23. Demirel, N. 2009. Determination of Heteroptera species on canola plants in Hatay province of Turkey. *African Journal of Agricultural Research,* 4(11): 1226-1233.
24. Demirsoy, A. 2002. *Genel Zoocoğrafya ve Türkiye Zoocoğrafyası*. [General zoogeography and zoogeography of Turkey.] Genişletilmiş 5. Baskı, Meteksan A.Ş., Ankara, 1007 pp.
25. Derjanschi, V.V. & Péricart, J. 2005. *Hémiptérés Pentatomoidea euro- méditerranéens 1. Généralités. Systématique: Prémiere Partie*. Faune de France, 90: 1–494.
26. Dönmez, Y. 1968. *Trakya'nın Bitki Coğrafyası. [Phytogeography of Thrace]*. In: İstanbul Üniversitesi

Yayınları. No. 1321. Taş Matbaası, İstanbul, 279 pp. [in Turkish, English abstract].

27. Dursun, A. 2004. *A Faunistic and Taxonomic Study on the Pentatomidae Heteroptera) Species of Middle Black Sea Region of Turkey*. Phd Thesis. Ondokuz Mayıs Universty, Institue of Natural and Applied Sciences, Biology Main Division, Samsun-Turkey, 176 pp. [in Turkish with English abstract].

28. Dursun, A. & Kartal, V. 2008a. Orta Karadeniz Bölgesi Halyini Amyot & Serville, 1843, Sciocorini Amyot & Serville, 1843, Aeliini Douglas & Scott, 1865 ve Eysarcorini Mulsant & Rey, 1866 (Heteroptera: Pentatomidae: Pentatominae) türleri üzerine faunistik bir araştırma. *Turkish Journal of Entomology*, 32(4): 303-315.

29. Dursun, A. & Kartal, V. 2008b. Orta Karadeniz Bölgesi Carpocorini Stål, 1876 (Heteroptera: Pentatomidae: Pentatominae) türleri üzerine faunistik bir araştırma. *Turkish Journal of Entomology*, 32(1): 43-59.

30. Dursun, A. & Kartal, V. 2008c. Orta Karadeniz Bölgesi Strachiini Mulsant & Rey, 1866, Pentatomini Leach, 1815 ve Piezodorini Atkinson, 1888 (Heteroptera: Pentatomidae: Pentatominae) türleri üzerine faunistik bir araştırma. *Turkish Journal of Entomology*, 32(3): 225-239.

31. Dursun, A. & Fent M. 2011a. Additional records on the Halyini, Carpocorini, Aeliini and Eysarcorini (Hemiptera: Pentatomidae: Pentatominae) of the Kelkit Valley, Turkey. *Biharean Biologist*, 5(2): 151-156.

32. Dursun A. & Fent, M. 2011b. Kelkit Vadisi Sciocorini Amyot & Serville, 1843 ve Strachiini Mulsant & Rey, 1866 (Hemiptera: Pentatomidae: Pentatominae) faunası üzerine çalışmalar. *Türkiye Entomoloji Bülteni*, 1(3): 181-188.

33. Dursun, A. & Fent, M. 2013. Overview of the subgenus *Ventocoris* s. str. (Hemiptera: Heteroptera: Pentatomidae) with new records and a revised key to the *Ventocoris* species of Turkey. *Zootaxa*, 3681(1): 151-177.

34. Dursun, A. & Fent, M. 2015. Notes on some little known species of Heteroptera from Turkey with new records for the fauna of Europe and the Turkish Thrace. *North-Western Journal of Zoology*, 11(1): 92-96.

35. Dursun, A. & Fent, M. 2017. Type Localities of Heteroptera (Insecta: Hemiptera) from Turkey. *Zootaxa*, 4227(4): 451-494.

36. Dursun, A. & Fent, M., 2018. Erstnachweis von *Perillus bioculatus* (Fabricius, 1775) (Hemiptera: Heteroptera: Pentatomidae) für Anatolien (Türkei). *Heteropteron*, 53: 18-20.

37. Dursun, A. 2021. Türkiye'de Dağılım Gösteren Yabancı Heteroptera (Insecta: Hemiptera) Türleri. *Bitki Korumada Son Gelişmeler,* 1: 145-171.

38. Dusoulier, F. & Lupoli, R. 2015. Les Pentatomoidea de France: clarifications taxinomiques et mises à jour nomenclatures et biogéographiques (Hemiptera: Heteroptera). *L'Entomologiste*, 71(6): 353-366.

39. Escherich, K. 1897. Beitrag zur Hemipterenfauna Kleinasiens. *Entomologische Nachrichten*, 23: 124-127.

40. Fahringer, J. 1922. Eine Rhynchotenausbeute aus der Türkei, Kleinasien und benachbarten Gebieten. *Konowia*, 1: 137-144.

41. Fent, M. & Aktaç, N. 1999. Edirne Yöresi Pentatomidae (Heteroptera) Faunası Üzerine Takasonomik ve Faunistik Araştırmalar. *Tukish Journal of Zoology*, 23(Ek Sayı 2): 377-395.

42. Fent, M. & Aktaç, N. 2002. Trakya Bölgesi Pentatomidae (Heteroptera) Faunası İçin Yeni Kayıtlar, 144 p. XVI. Ulusal Biyoloji Kongresi, İnönü Üniversitesi, 3-7 Eylül, Malatya-Türkiye.

43. Fent, M. & Aktaç, N. 2007a. Die Verbreitung des *Perillus bioculatus* (Fab.) Heteroptera Pentatomidae: Asopinae) im Türkischen teil Thrakiens. *Heteropteron*, 25: 7-10.

44. Fent, M. & Aktaç, N. 2007b. New records of the Pentatomoidea (Heteroptera) fauna for Europe, Turkey and the Turkish Thrace. *Entomological News*, 118(4): 336-349.

45. Fent, M. & Aktaç, N. 2008. Anmerkungen zu einigen im Adultstadium Überwinternden Heteropteren und ihrer Überwinterungsplätze in der Türkischen Provinz Edirne. *Heteropteron*, 28: 11-15.

46. Fent, M. 2010. Contributions to Pentatomoidea (Heteroptera) fauna of Western Black Sea Region with a new record for Anatolian fauna: *Neottiglossa lineolata* (Mulsant & Rey, 1852). *Journal of the Entomological Research Society*, 12(1): 53-65.

47. Fent, M., Dursun, A., Karsavuran, Y., Tezcan, S. & Demirözer, O. 2010a. A review of the tribe Halyini in Turkey (Hemiptera: Heteroptera: Pentatomidae) with two new records: *Apodiphus integriceps* and *Mustha vicina*. *Journal of the Entomological Research Society*, 12(2): 1-13.

48. Fent, M., Gözüaçık, C. & Yiğit, A. 2010b. Türkiye *Bagrada* Stål, 1862 (Pentatomidae: Strachiini) cinsi türlerinin gözden geçirilmesi ve yeni bir kayıt: *Bagrada amoenula* (Walker, 1870). *Turkish Journal of Entomology*, 34(1): 75-87.

49. Fent, M. 2011. Gökçeada ve Bozcaada Heteroptera (Insecta: Hemiptera) Faunasına Katkılar, *Trakya University Journal of Science*, 12(1): 35-46.

50. Fent, M., Kment, P., Elipek-Çamur, B. & Kırgız, T. 2011. Annotated catalogue of Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorpha and Leptopodomorpha (Hemiptera: Heteroptera) of Turkey with new records. *Zootaxa*, 2856: 1-84.

51. Fent, M. & Japoshvili, G. 2012. Heteroptera (Hemiptera) Fauna of Isparta-Gölcük Natural Park with some rare and peculiar species and new records for Mediterranean Region of Turkey. *Türkiye Entomoloji Bülteni*, 2(3): 149-163.

52. Fent, M., Dursun, A. & Tezcan, S. 2013. First record of *Graphosoma inexpectatum* (Heteroptera, Pentatomidae, Podopinae) from Turkey with description of the female. *ZooKeys*, 319: 51-57.

53. Fent, M. & Dursun, A. 2016. Neue Funde und Beiträge zur Heteropteren-Fauna (Hemiptera: Heteroptera) des Thrakien-Gebietes in der Türkei. *Heteropteron*, 47: 24-26.

54. Fieber, F.X. 1861. Die europäischen Hemiptera. Halbflügler (Rhynchota Heteroptera). Druck und Verlag von Carl Gerolds Sohn, Wien, 444 pp.

55. Fieber, F.X. 1864. Neuere Entdeckungen in europäischen Hemipteren (Fortsetzung). *Wiener Entomologische Monatschrift*, 8: 321-335.

56. Fieber, F.X. 1868. Die europäischen Aelia-Arten. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien*, 18: 465-478.

57. Göktürk, T. 2020. The investigation of effectiveness of light and pheromone traps on control of *Halyomorpha halys* (Stal). *Journal of Forestry Faculty*, 21(2): 270-275.

58. Göktürk, T. & Tozlu, G. 2019. An important agricultural pest for Turkey: invasive species *Halyomorpha halys*. 283-297. Paper presented at the Proceedings of International Black Sea Coastline Countries Symposium, 2-5 May, Batumi-Georgia.

59. Gadeau De Kerville, H. 1939. *Voyage zoologique d'Henri Gadeu de Kerville en Asie Mineure (April-Mai 1912)*. Paul Le Chevalier, Paris, 148 pp.

60. Gapon, D.A. 2008. A revision of *Leprosoma* Baerensprung, 1859 (Heteroptera, Pentatomidae). pp. 105-120. In: Grozeva, S. & Simov, N. (eds), *Advances in Heteroptera research*. Festschrift in Honour of 80th Anniversary of Michael Josifov, Pensoft Publishers, Sofia-Moscow, 422 pp..

61. Ghahari, H., Moulet, P. & Rider, D. 2014. An annotated catalog of the Iranian Pentatomoidea (Hemiptera: Heteroptera: Pentatomomorpha). *Zootaxa*, 3837(1): 1-95.

62. Ghauri, M.S.K. 1977. A revision of *Apodiphus* Spinola (Heteroptera: Pentatomidae). *Bulletin of Entomological Research*, 67: 97-106.

63. Gözüaçık, C., Fent, M. & Özgen, İ. 2011. Güneydoğu Anadolu Bölgesi Pentatomidae (Hemiptera: Heteroptera) faunasına katkılar. *Türkiye Entomoloji Bülteni*, 1(4): 235-252.

64. Güncan, A. & Gümüş, E. 2019. Brown marmorated stink bug, *Halyomorpha halys* (Stål, 1855) (Hemiptera: Heteroptera, Pentatomidae), a new and important pest in Turkey. *Entomological News*, 128(2): 204-210.

65. Heckmann, R., Strauß, G. & Rietschel, S. 2015. Die Heteropteren fauna Kretas. *Carolinea*, 7: 83-130.

66. Henry, T.J. 2017. Biodiversity of Heteroptera. In: Foottit, R. G. & Adler, P. H. (eds): *Insect Biodiversity. Science and Society. Vol. I. Second edition.* Wiley-Blackwell, Oxford, 904 pp.

67. Hoberlandt, L. 1956. Results of the zoological scientific expedition of the National Museum in Praha to Turkey, 18. Hemiptera IV. terrestrial Hemiptera-Heteroptera of Turkey. *Acta Entomologica Musei Nationalis Pragae*, 3(1955): 1-264.

68. Hoberlandt, L. 1961. Heteroptera collected in Ankara (Turkey) by light trap. *Acta Entomologica Musei Nationalis Pragae*, 34: 399-416.

69. Hoberlandt, L. & Safavi, M. 1981. Results of the Czechoslovak-Iranian entomological expeditions to Iran. Heteroptera: Pentatomidae. Phyllocephalinae. *Acta Entomologica Musei Nationalis Pragae*, 40: 33-43.

70. Horváth, G. 1881. Hemiptera nova vel minus cognita. *Természetrajzi Füzetek*, 5: 39-42.

71. Horváth, G. 1883. Heteroptera Anatolica in regione Brussae collecta enumeravit. *Természetrajzi Füzetek*, 7: 21-30.

72. Horváth, G. 1889. Essai monographique sur le genre *Trigonosoma*. *Revue d'Entomologie*, 8: 33-49.

73. Horváth, G. 1890. Conspectus specierum generis *Mustha* (Hemiptera, Pentatomidae). *Revue d'Entomologie*, 9: 262-264.

74. Horváth, G. 1891. Hémiptères recueillis dans l'Arménie russe avec la description d'espèces et variétés nouvelles. *Revue d'Entomologie*, 10(3): 68-79.

75. Horváth, G. 1894. Hemipteres recueillis dans la Russie meridionale et en Transcaucasie. *Revue d'Entomologie*, 15: 169-189.

76. Horváth, G. 1895. Hémiptères nouveaux d'Europe et des pays limitrophes. *Revue d'Entomologie,* 14: 152-165.

77. Horváth, G. 1896. Notes sur le genre *Trigonosoma*. *Revue d'Entomologie*, 15: 1-231.

78. Horváth, G. 1897. Description d'Hémiptères nouveaux et notes diverses. *Revue d'Entomologie* 16: 81-97.

79. Horváth, G. 1901. Hémiptères du voyage de M. Martinez Escalera dans l' Asie-Mineure. *Természetrajzi Füzetek*, 24: 469-485.

80. Horváth, G. 1903a. Pentatomidae novae extraeuropaeae.- *Annales Historico-Naturales Musei Nationalis Hungarici*, 1: 400-409.

81. Horváth, G. 1903b. Conspectus specierum generis *Graphosoma*. *Annales Musei Nationalis Hungarici*, 1: 345-354.

82. Horváth, G. 1905. Ergebnisse einer naturwissenschaftlichen Reise zum Erdschias-Dagh (Kleinasien) ausgeführt von Dr. Arnold Penther und Dr. Emerich Zederbauer. Hemipteren.- *Annalen des Naturhistorischen Hofmuseums Wien*, 20: 179-189.

83. Horváth, G. 1909. Les *Graphosoma* d'Europe. *Annales Historico-Naturales Musei Nationalis Hungarici*, 7: 143-150.

84. Horváth, G. 1917. Hemiptera palaearctica nova vel minus cognita. I. *Annales Musei Nationalis Hungarici*, 15: 365-381.

85. Horváth, G. 1918. Ad cognitionem faunae hemipterorum balcanicae. *Annales Historico-Naturales Musei Nationalis Hungarici*, 16: 321-340.

86. Horváth, G. 1919. Ergebnisse einer mit Unterstützung der Kais. Akademie der Wissenschaften in Wien ausgeführten zoologischen Forschungsreise von weiland Prof. Dr. Franz Tölg nach Kleinasien (Amanus Gebirge).V. Rhynchota. *Archiv Naturgeschichte*, 85: 146-147.

87. Horváth, G. 1936. Monographia Pentatomidarum generis Bagrada. *Annales Historico-Naturales Musei Nationalis Hungarici*, 30: 22-47.

88. Isakov, Y.M. 2000. Notes on the Taxonomy and Bionomics of *Stagonomus bipunctatus* (Heteroptera, Pentatomidae). *Vestnik zoologii*, 34(3): 83-88.

89. Josifov, M.V. 1986. Verzeichnis der von der Balkanhalbinsel bekannten Heteropterenarten (Insecta, Heteroptera). *Faunistische Abhandlungen Staatliches Museum für Tierkunde Dresden,* 14: 61-93.

90. Kaçar, G. & Dursun, A. 2015. Survey and abundance of Suborder Heteroptera: Pest and beneficial species in olive groves of Turkey. *Egyptian Journal of Biological Pest Control*, 25(2): 499-502.

91. Karsavuran, Y., Demirözer, O., Aslan, B. & Karaca, İ. 2008. Faunistic studies on Pentatomidae and Scutellaridae families belonging to Heteroptera order in the region of Isparta, Turkey. *Journal of Entomology*, 5(3): 213-217.

92. Karsavuran, Y., Çelik, Ş.N. & Eltez, S. 2013. Domates Meyvesinin Farklı Gelişme Dönemlerinde *Nezara viridula* (L.) (Hemiptera: Pentatomidae)'nın Beslenme Davranışı. *Ege Üniviversitesi Ziraat Fakültesi Dergisi*, 50(2): 171-180.

93. Karsavuran, Y., Birgücü, A.K. & Almadık, A. 2012. Fasulyede beslenen *Nezara viridula* (L.) (Hemiptera: Pentatomidae)'nın yaprak ve bakla organları arasındaki tercihi. *Ege Üniversitesi Ziraat Fakültesi Dergisi*, 49(2): 113-118.

94. Kemal, M., Bakan, B. & Yalçın, M. 2013. *Graphosoma* (*Graphosomella*) *inexpectatum*, a new record for the fauna of Turkey. *Cesa News*, 85: 1-4.

95. Kiritshenko, A.N. 1918. Hemiptera-Heteroptera faunae Caucasicae. Pars I. *Memories Museum Caucase*, 6: 1-177.

96. Kiritshenko, A.N. 1924. Beitrag zur Hemipterenfauna des südlichen Armenien. *Wiener Entomologische Zeitung*, 41: 1-5.

97. Kiritshenko, A.N. 1930. Beiträge zur Kenntnis palaearktischer Hemipteren. II. Neue Aelia-Arten (Hemiptera, Pentatomidae). *Konowia*, 8(1929): 451-456.

98. Kiritshenko, A.N. 1938. Die echten Halbflügler (Hemiptera) der Nachitschewan ASSR. *Trudy Zoologicheskogo Instituta Akademiya Nauk SSSR, Azerbaidzhanskii filial*, 8: 75-121 [in Russian and German].

99. Kment, P. & Jindra, Z. 2006. New and interesting records of true bugs (Heteroptera) from Turkey, southeastern Europe, Near and Middle East. *Acta Entomologica Musei Nationalis Prag*, 45(2005): 3-16.

100. Kment, P. & Jindra, Z. 2008. New records of *Eurydema fieberi* from the Czech Republic with corrections to some previously published records of Palaearctic Eurydema species (Hemiptera: Heteroptera: Pentatomidae). *Acta Musei Moraviae Scientiae biologicae (Brno)*, 93: 11-27.

101. Kıvan, M. 1998. *Eurygaster integriceps* Put. (Heteroptera: Scuteleridae)'nin yumurta parazitoiti *Trissolcus semistriatus* Nees (Hymenoptera: Scelionidae)'un biyolojisi üzerinde araştırmalar. *Turkish Joumal of Entomology*, 22(4): 243-257.

102. Kıvan, M. 2004. Some observations on *Perillus bioculatus* (F.) (Heteroptera: Pentatomidae) a new record for the entomofauna of Turkey. *Turkish Joumal of Entomology*, 28: 95-98.

103. Kıyak, S. 1990. Systematisch-Ökologische Untersuchungen über die Wanzen (Insecta: Heteroptera) Aus dem Gebiet Hazar-See, Maden und Ergani (Prov. Elazığ)-II. *Gazi Üniversitesi Fen Bilimleri Dergisi*, 1: 97-144.

104. Kıyak, S. 1993. Über terrestrische Wanzenarten von Soğuksu Nationalpark, Ankara, Türkei. *Priamus*, 6(3/4): 131-156.

105. Kıyak, S. 2000. Işık Dağı ve çevresinde yaşayan Heteroptera (Insecta) türlerinin faunistik, sistematik ve ekolojik yönden araştırılması-II. Gazi Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 13(2): 347-367.

106. Kıyak, S. 2016. On Heteroptera fauna of Binboğa Mountains (Turkey, Kahramanmaraş-Kayseri). *Munis Entomology & Zoology*, 11(2): 441-449.

107. Kıyak, S. & Ün, E. 1999. Die ersten Belege von *Vilpianus galii* (Wolff,1802), in der anatolischen fauna (Insecta, Heteroptera, Pentatomidae). *Journal of Entomological Research Society*, 1(1): 23-28.

108. Kıyak, S., Alacapunar, P. & Özdamar, H. 2019. The Second Record of *Perillus bioculatus* (Fabricius, 1775) (Hemiptera: Heteroptera: Pentatomidae), Invasive Alien Species (IAS) from Anatolia. *Journal of the Heteroptera of Turkey*, 1(1-2): 4-6.

109. Kıyak, S., Özsaraç, Ö. & Salur, A. 2004. Additional notes on the Heteroptera fauna of Nevşehir Province (Turkey). *Gazi University Journal of Science*, 17(1): 21-29.

110. Küçükbasmacı, İ. & Kıyak, S. 2015. A study on the fauna of Heteroptera of Ilgaz Mountains (Kastamonu, Çankırı) with a new record for Turkey. *Nevşehir Bilim ve Teknoloji Dergisi*, 4(1): 1-33.

111. Külekçi, G., Yıldırım, E. & Tezcan, S. 2009. Contribution to the knowledge of the Pentatomidae (Heteroptera) fauna of Turkey. *Linzer biologische Beitrage*, 41(1): 697-708.

112. Lefebvre, A. 1831. Description de *Halys spinosula*. *Magasin de Zoologie*, 1(21): 2.

113. Linnavuori, R. 1954. A Palaearctic Heteropterous material collected by J. Sahlberg and U. Saalas. *Annales Entomologici Fennici*, 19(1953): 147-167.

114. Linnavuori R. 1965. Studies on the South-and Eastmediterranean Hemipterous Fauna. III. Hemipterological observations from Turkey. *Acta Entomologica Fennica*, 21: 44-61.

115. Lodos, N. 1959. A new species of *Graphosoma* from Turkey (Heteroptera–Pentatomidae). *Annals and Magazine of Natural History*, 13(1): 711-713.

116. Lodos, N. 1963. A new species of *Eurygaster* and notes on some little known species of Turkish Pentatomidae. *Psyche*, 70(15): 144-150.

117. Lodos, N. & Önder, F. 1978. Contribution to the study of Turkish Pentatomoidea (Heteroptera). I. Tarisa A.S. *Türkiye Bitki Koruma Dergisi*, 2: 15-29.

118. Lodos, N. & Önder, F. 1980. Two new species of Pentatomidae from Turkey (Heteroptera). *Türkiye Bitki Koruma Dergisi*, 4: 7-13.

119. Lodos, N. & Önder, F. 1982. Contrubution to the study on the Turkish Pentatomoidae (Heteroptera) V. Sciocorini Bergroth (Pentatomidae). *Türkiye Bitki Koruma Dergisi,* 6: 133-146.

120. Lodos, N. & Önder, F. 1983. Controbution to the study on the Turkish Pentatomoidea (Heteroptera) VI. Asopinae (Amyot & Serville, 1843). *Türkiye Bitki Kouma Dergisi*, 7(4): 221-230.

121. Lodos, N., Önder, F., Pehlivan, E. & Atalay, R. 1978. Ege ve Marmara Bölgesi'nin zararlı böcek faunasının tespiti üzerinde çalışmalar. [Curculionidae, Scarabaeidae (Coleoptera), Pentatomidae, Lygaeidae, Miridae (Heteroptera)]. T.*C. Gıda-Tarım ve Hayvancılık Bakanlığı Zirai Mücadele ve Karantina Genel Müdürlüğü*, 135-169.

122. Lodos, N., Önder, F., Pehlivan, E., Erkin, E., Karsavuran, Y. & Aksoy, S. 1982. Orta Anadolu ve Batı Karadeniz Bölgeleri'nin zararlı böcek faunasının tespiti üzerinde çalışmalar. Curculionidae Scarabaeidae (Coleoptera),

Pentatomidae, Lygaeidae, Miridae (Heteroptera). TOAG/336 numaralı basılmamış proje raporu, 20 pp.

123. Lodos, N., Önder F., Pehlivan, E. Atalay, R., Erkin, E., Karsavuran, Y., Tezcan, S. & Aksoy, S. 1998. *Faunistic Studies on Pentatomoidea (Plataspidae, Acanthosomatidae, Cydnidae, Scutelleridae, Pentatomidae) of Western Black Sea, Central Anatolia and Mediterranean Regions of Turkey*. Ege Üniversitesi Bornova-İzmir, 75 pp.

124. Lupoli, R. 2017. *Graphosoma lineatum* (L., 1758) et *G. italicum* (O.F. Müller, 1766), deux espèces valides et distinctes, probablement issues de la transgression zancléenne méditerranéenne (Hemiptera Pentatomidae). *L'Entomologiste*, 73: 19-33.

125. Matocq, A., Pluot-Sigwalt, D. & Özgen, İ. 2014. Terrestrial Hemiptera (Heteroptera) collected in South-East Anatolia (Diyarbakır, Mardin and Elazığ provinces) (Turkey): second list. *Munis Entomology & Zoology*, 9(2): 884-930.

126. Memişoğlu, H., Melan, K., Özkan, M., Kılıç, A.U. & Dörtbudak, Y. 1996. Orta Anadolu Bölgesi'nde kımıl (*Aelia rostrata* Boh.)'ın kışlama ve göç durumu üzerinde araştırmalar. *Bitki Koruma Bülteni*, 36(3-4): 115-142.

127. Memon, N. & Ahmad, I. 2008. Description of *Mustha izmirensis*, new species (Heteroptera: Pentatomidae: Halyini) from Bomova, Izmir, Turkey with key to its world species. *Pakistan Journal of Zoology*, 40: 435-439.

128. Orçan, S.Ö. & Kıvan, M. 2017. Pentatomidae (Hemiptera) species on fruit trees in Saray district of Tekirdağ, Turkey. Global Journal of Advanced Research, 4(10): 293-300.

129. Önder, F. & Adıguzel, N. 1979. Some Heteroptera collected by light trap in Diyarbakır (Turkey). *Türkiye Bitki Koruma Dergisi*, 3(1): 25-34.

130. Önder, F., Atalay, R. & Karsavuran, Y. 1983. İzmir ili ve çevresinde kışı ergin halde geçiren Heteroptera türleri ve kışlak yerleri üzerinde araştırmalar II. Lygaeoidea, Pentatomoidea. *Türkiye Bitki Koruma Dergisi*, 7: 129-144.

131. Önder, F., Karsavuran, Y., Pehlivan, E. & Turanlı, F. 1995. Güneydoğu Anadolu Projesi (GAP) uygulama alanında saptanan Pentatomoidea (Heteroptera) türleriyle ilgili bir değerlendirme. GAP Bölgesi Bitki Koruma Sorunları ve Çözüm Önerileri Sempozyumu, 27-29 Nisan, Şanlıurfa, Türkiye, 120-130.

132. Önder, F., Karsavuran, Y., Tezcan, S. & Fent, M. 2006. *Türkiye Heteroptera (Insecta) Kataloğu*. Meta Basım Matbaacılık Hizmetleri, İzmir, 164 pp.

133. Önder, F., Ünal, A. & Ünal, E. 1981. Heteroptera fauna collected by light traps in some districts of Northwestern part of Anatolia. *Türkiye Bitki Koruma Dergisi,* 5(3): 151-169.

134. Önder F., Ünal A. & Ünal E. 1984: Heteropterous insects collected by light traps in Edirne. *Türkiye Bitki Koruma Dergisi*, 8(4): 215-224.

135. Özdemir, İ.O. & Tuncer, C. 2021. A new invasive polyphagous pest in Turkey, Brown Marmorated Stink Bug [*Halyomorpha halys* (Stål, 1855) (Hemiptera: Pentatomidae)]: identification, similar species and current status, Black Sea. *Journal of Engineering and Science*, 4(2): 58-67.

136. Özsaraç, Ö. & Kıyak, S. 2001. A study on the Heteroptera fauna of Bozcaada (Çanakkale Province). *Journal of Zoology*, 25: 313-322.

137. Özsaraç, H., Kıyak, S. & Özsaraç, Ö. 2001. A Study on the Fauna of Heteroptera of Gökçeada (Çanakkale)-II. *Journal of the Institute of Science and Technology of Gazi University*, 14(4): 1167-1182.

138. Özgen, İ. 2012. The species of suborder Heteroptera (Hemiptera) on vineyards agroecosystems which found in Diyarbakır, Elazığ and Mardin provinces, Turkey. *Munis Entomology & Zoology*, 7(1): 255-258.

139. Özgen, İ. & Çerçi, B. 2018. First record of the narrow stink bug *Mecidea lindbergi* Wagner 1954 (Hemiptera: Heteroptera: Pentatomidae: Mecideini) from Turkey. *Ecologia Balkanica*, 10(1): 53-56.

140. Özgen, İ., Çerçi, B. & Kaya, C. 2018. Heteroptera (Hemiptera) species determined in pistachio orchards of Siirt province with a new record for fauna of Turkey: *Yotvata nergal* Linnavuori 1993. *Cercetări Agronomice în Moldova*, LI, 4(176): 87-95.

141. Özgen, İ. & Dioli, P. 2018. Additional faunistic notes on Pentatomidae and Scutelleridae (Heteroptera) in Bingöl, Elazığ and Tunceli province (Turkey). *International Journal of Fauna and Biological Studies*, 5(5): 24-26.

142. Özgen, İ., Dioli, P. & Çerçi, B. 2021. Additional notes on Heteroptera (Hemiptera) of Eastern Turkey. *International Journal of Fauna and Biological Studies*, 8(1): 1-4.

143. Özgen, İ., Gözüaçık, C., Karsavuran, Y. & Fent M. 2005a. Doğu ve Güneydoğu Anadolu Bölgesi'nde antepfıstığı, kayısı, kiraz ve zeytin ağaçlarında bulunan Pentatomidae (Heteroptera) familyasına ait türlerin saptanması üzerinde çalışmalar. *Ege Üniversitesi Ziraat Fakültesi Dergisi*, 42: 35-43.

144. Özgen, İ., Gözüaçık, C., Karsavuran, Y. & Fent, M. 2005b. Güneydoğu Anadolu Bölgesi buğday alanlarında bulunan Pentatomidae (Heteroptera) familyasına ait türler üzerinde araştırmalar. *Turkish Journal of Entomology*, 29(1): 61-68.

145. Péricart, J. 2004. Note sur quelques espèces de Strachiini (Heteroptera, Pentatomidae). *Bulletin de la Société Entomologique de France*, 109: 367-374.

146. Péricart, J. 2010. H*émiptères Pentatomoidea Euro-Méditerranéens. Vol. 3. Podopinae et Asopinae. Faune de France. Vol. 93*. Fédération Française des Sociétés de Sciences Naturelles, Paris, 291 pp.

147. Puton, A. 1892. Hémiptères nouveaux ou peu connus et notes divers. IV. Hémiptères d'Akbes. Region de l'Amanus (Syrie septentrionale). Récoltés par M. Delagrange. *Revue d'Entomologie*, 11: 24-36.

148. Puton, A. 1895. Hémiptères nouveaux. *Revue d'Entomologie,* 14: 83-91.

149. Puton, A. 1896. Hémiptères nouveaux. Localités nouvelles. *Revue d'Entomologie (Caen)*, 15: 232–234.

150. Puton, A. & Noualhier, M. 1895. Supplement a la liste des Hémiptères d'Akbès. *Revue d'Entomologie*, 14: 170-177.

151. Reuter, O.M. 1890. Notes geographiques sur les Heteropteres palearctiques. *Revue d'Entomologie*, 9: 237-245.

152. Reuter, O.M. 1900. Heteroptera palaearctica nova et minus cognita. I. *Öfversigt af Finska Vetenskaps-Societetens Förhandlingar,* 42: 209-239.

153. Reuter, O.M. 1901. Monographia generis *Tarisa* Am. et Serv. *Öfversigt af Finska Vetenskaps Societetens Förhandlingar*, 43: 25-48.

154. Reuter, O.M. 1913. Ausführliche Beschreibungen einiger paläarktischen Hemipteren. *Öfversigt af Finska Vetenskaps-Societetens Förhandlingar*, 55A(14): 1-111.

155. Ribes, J. & Gapon, D.A. 2006. Taxonomic review of the genus *Holcogaster* Fieber, 1860 (Heteroptera: Pentatomidae) with the description of the male and female genitalia. *Russian Entomological Journal*, 15: 189-1 95.

156. Ribes, J. & Pagola-Carte, S. 2013. *Hémiptères Pentatomoidea Euro-Méditerranéens. Volume 2: Systématique: deuxième partie sous-famille Pentatominae (suite et fin)*. Faune de France, 96. Paris, Fédération française des sociétés de sciences naturelles, 423 pp.

157. Ribes, J., Pagola-Carte, S. & Valcárcel, J.P. 2006. Una sinonimia restituida en el género *Holcostethus* Fieber, 1860 (Hemiptera: Heteroptera: Pentatomidae). *Boletín de la Asociación española de Entomología*, 39: 407-408.

158. Rider, D.A. 2006. Family Pentatomidae Leach., pp. 233-414. In: Aukema, B. & Rieger, C. (Eds.), *Catalogue of Heteroptera of the Palaearctic Region*. Vol. 5. Pentatomomorpha II. Netherlands Entomological Society, Amsterdam, xiv + 550 pp.

159. Rider, D.A., Schwertner, C.F., Vilímová, J., Rédei, D., Kment, P. & Thomas, D.B. 2018. *Higher Systematics of the Pentatomoidea*. pp. 25-201. In: J. E. McPherson (ed.), *Invasive Stink Bugs and Related Species (Pentatomoidea): Biology, Higher Systematics, Semiochemistry, and Management*. *American Entomologist*, 64 (3): 819 pp.

160. Roca-Cusachs, M. & Jung, S.H. 2019. Redefining *Stagonomus* Gorski based on morphological and molecular data (Pentatomidae: Eysarcorini). *Zootaxa*, 4658(2): 368-374.

161. Roca-Cusachs, M., Schwertner, C.F., Kim, J., Eger, J., Grazia, J. & Jung, S. 2022. Opening Pandora's box: molecular phylogeny of the stink bugs (Hemiptera: Heteroptera: Pentatomidae) reveals great incongruences in the current classification. *Systematic Entomology*, 47: 36-51.

162. Saruhan, İ. & Tuncer, C. 2006. *Palomena prasina* L. (Heteroptera: Pentatomidae)'nın bazı morfolojik ve biyolojik özelliklerinin saptanması üzerinde araştırmalar. *Turkish Journal of Entomology*, 30(1): 43-56.

163. Schmitschek, E. 1944. *Forstinsecten der Türkei und ihre Umwelt*. Grundlagen der türkischen Forstentomologie. Prag, XVI-371 pp.

164. Seidenstücker, G. 1957. Heteroptera aus Anatolien I. *Istanbul Universitesi Fen Fakültesi Mecmuası*, 22: 179-189.

165. Seidenstücker, G. 1958. Heteroptera aus Anatolien II. *Istanbul Universitesi Fen Fakültesi Mecmuası*, 23: 119-129.

166. Seidenstücker, G. 1960. Heteroptera aus Anatolien III. *Istanbul Universitesi Fen Fakültesi Mecmuası*, 25: 145-154.

167. Seidenstücker. G. 1964. *Ventocoris bulbifer* n. sp., eine neue Pentatomiden Art aus der Türkei (Hemiptera, Heteroptera). *Reichenbachia Staatliches Museum für Tierkunde in Dresden*, 4(13): 97-103.

168. Seidenstücker, G. 1965. *Stagonomus devius* n. sp., eine neue Schildwanze aus der Türkei (Heteroptera, Pentatomidae*). Reichenbachia*, 5(3): 10-19.

169. Seidenstücker, G. 1975. Über anatolischen Schildwanzen. *Reichenbachia*, 15: 259–268.

170. Suludere, Z., Candan, S. & Kalendee, Y. 1999. Chorionic sculpturing in eggs of six species of Eurydema (Heteroptera, Pentatomidae): A scanning electron microscope investigation. *Journal of the Entomological Research Society*, 1(2): 27-56.

171. Şerban, C. 2010. Faunistic data on some true bugs [*sic*!] species (Insecta: Heteroptera) from West Turkey. [Results of the "Taurus" – 2005 and "Focida" – 2006 expeditions]. *Travaux du Muséum National d'Histoire Naturelle „Grigore Antipa"*, 53: 171-180.

172. Tarla, S. & Tarla, G. 2018. Detection of *Perillus bioculatus* (F.) (Heteroplera: Pentatomidae) on a New Host in Anatolia. *International Journal of Agriculture Innovations and Research*, 7(3): 2319-1473.

173. Tezcan, S., Gülperçin, N. & Fent, M. 2010. Contribution to the knowledge of the light trap collected Heteroptera fauna occurring in cherry orchards in western Turkey. *Linzer biologische Beitrage*, 42(1): 817-823.

174. Tezcan, S., Gülperçin, N. & Fent, M. 2013. Aspat (Strobilos) antik kenti ve çevresindeki (Bodrum, Muğla) tarım teraslarının Scutelleridae, Cydnidae ve Pentatomidae (Hemiptera:Pentatomoidea) faunası üzerinde bir analiz. *Turkish Journal of Entomology*, 37(2): 249-259.

175. Thomas, D.B. 1994. Taxonomic synopsis of the Old World asopine genera (Heteroptera: Pentatomidae). *Insecta Mundi*, 8: 145-212.

176. Tuatay, N., Kalkandelen, A. & Aysev, N. 1972. Nebat Koruma Müzesi Böcek Kataloğu (1961-1971). T.C. Tarım Bakanlıgı Ziraai Mücadele ve Zirai Karantina Genel Müdürlügü Yayınları, Ankara, 119 pp.

177. Wagner, E. 1959. Beitrag zur Heteropteren-fauna Anatoliens. *Zeitschrift für Angewandte Entomologie*, 44: 102-113.

178. Wagner, E. 1966. Eine Heteropterenausbeute aus der Türkei (Hemiptera, Heteroptera). *Bulletin Recherches Agronomiques Gembloux*, 1: 647-654.

179. Yazıcı G., Yıldırım, E. & Moulet, P. 2014. Contribution to the knowledge of the Pentatomidae and Plataspidae (Hemiptera, Heteroptera, Pentatomomorpha) fauna of Turkey. *Linzer biologische Beitrage*, 46(2): 1819-1842.

180. Yılmaz, F. 1996. Türkiye'de *Eurydema* Lap. (Heteroptera: Pentatomidae) Türleri Üzerinde Sistematik Araştırmalar. *Phd Thesis, Ege University, Institue* of *Natural and Applied Sciences*, 80 pp.

http://dergipark.org.tr/trkjnat
Trakya University Journal of Natural Sciences, 23(Special Issue): S113-S129, 2022
ISSN 2528-9691
DOI: 10.23902/trkjnat.1123152

Review
Special Issue: Biodiversity of Insects

CHECKLIST OF TURKISH COCCOIDEA (HEMIPTERA: STERNORRYNCHA) SPECIES

Selma ÜLGENTÜRK[1], Cansu ERCAN[2], Bülent YAŞAR[3], M. Bora KAYDAN[4*]

[1] Ankara University, Agriculture Faculty, Plant Protection Department, Ankara, TÜRKİYE
[2] Biotechnology Application and Research Centre, Çukurova University, 01250, Adana, TÜRKİYE
[3] Isparta University of Applied Sciences Faculty of Agriculture, Departmet of Plant Protection, Isparta, TÜRKİYE
[4] Imamoglu Vocational School, Çukurova Üniversity, Adana, 01330, TÜRKİYE

Cite this article as:

Ülgentürk S., Ercan C., Yaşar B. & Kaydan M.B. 2022. Checklist of Turkish Coccoidea (Hemiptera: Sternorryncha) species. *Trakya Univ J Nat Sci*, 23(Special Issue): S113-S129, DOI: 10.23902/trkjnat.1123152

Received: 30 May 2022, Accepted: 12 July 2022, Published: 20 July 2022

Edited by:
Kadri KIRAN

****Corresponding Author:***
M. Bora Kaydan
bkaydan@cu.edu.tr

ORCID iDs of the authors:
SÜ. orcid.org/0000-0000-0000-0000
CE. orcid.org/0000-0000-0000-0000
BY. orcid.org/0000-0002-2302-2267
MBY. orcid.org/0000-0002-0677-255X

Key words:
Türkiye
Coccoidea
Scale Insect
Armored Scale Insect
Mealybugs

Abstract: The super family Coccoidea (Hemiptera: Sternorryncha) or scale insects, contains many agricultural pests throughout the world. The last checklist for Türkiye was published in 2013, and included 359 species in 12 families. Here we update the list which now has 409 species belonging to 150 genera in 20 families. The family Diaspididae is the most specious family with 120 species in 46 genera, followed by Pseudococcidae with 120 species in 41 genera, and Coccidae with 72 species in 30 genera. The other families included in the list are Acanthococcidae (36 species, 12 genera), Asterolecaniidae (12 species, 4 genera), Dactylopiidae (1 species, 1 genus), Cerococcidae (2 species, 1 genus), Cryptococcidae (2 species, 2 genera), Eriococcidae (2 species, 1 genus), Kermesidae (12 species, 2 genera), Leconodiaspidae (1 species, 1 genus), Marchalinidae (2 species, 1 genus), Margarodidae (9 species, 2 genera), Matsucoccidae (2 species, 1 genus), Micrococcidae (1 species, 1 genus), Monophlebidae (3 species, 3 genera), Ortheziidae (3 species, 1 genus), Phoenicococcidae (1 species, 1 genus), Putoidae (4 species, 1 genus) and Rhizoecidae (5 species, 2 genera).

Özet: Coccoidea üstfamilyası (Hemiptera: Sternorryncha) tüm dünyada birçok zararlı türe sahiptir. Türkiye'de bulunan coccidlerin kontrol listesi en son 2013 tarihinde yayınlanmış olup liste 12 familyaya ait 359 tür içermektedir. Bu çalışmada 20 familyaya bağlı 150 cins içerisinde bulunan 409 tür olacak şekilde güncellenmektedir. Tür sayısı bakımından Diaspididae familyası 46 cinse bağlı 120 tür ile en çok türü barındıran familya iken bunu 41 cinsten 120 tür ile Pseudococcidae familyası ve 30 cinse ait 72 tür ile Coccidae familyası takip etmektedir. Diğer familyalar Acanthococcidae (36 tür, 12 cins), Asterolecaniidae (12 tür, 4 cins), Dactylopiidae (1 tür, 1 cins), Cerococcidae (2 tür, 1 cins), Cryptococcidae (2 tür,2 cins), Eriococcidae (2 tür, 1 cins), Kermesidae (12 tür, 2 cins), Leconodiaspidae (1 tür, 1 cins), Marchalinidae (2 tür, 1 cins), Margarodidae (9 tür, 2 cins), Matsucoccidae (2 tür, 1 cins), Micrococcidae (1 tür, 1 cins), Monophlebidae (3 tür, 3 cins), Ortheziidae (3 tür, 1 cins), Phoenicococcidae (1 tür, 1 cins), Putoidae (4 tür, 1 cins) and Rhizoecidae (5 tür, 2 cins) olarak listelenmiştir.

Introduction

Due to the fact that Türkiye is a bridge between continents, its climate and geographical features change in short distances. Türkiye is a small continent in terms of biodiversity with its forest, mountain, steppe, wetland, coastal and marine ecosystems, their different forms and combinations. This extraordinary diversity of ecosystems and habitats also includes significant species diversity. Öncüer (1991) listed 2391 parasitic and predatory species of insect pests in Türkiye. Scale insect species (Hemiptera: Sternorryncha) are well-known insects with important agricultural pests in Türkiye as well as in the world. The first records about these pests were printed in Arabic letters during the Ottoman Empire making it difficult for today's scientists to read. However, some scale insect species found in Türkiye were included in some publications abroad (Fahringer 1912, Lindinger 1912). In fact, it is known that during the Ottoman Empire period, *Icerya puchasi* Maskell (Hemiptera: Monophlebidae) caused major problems in citrus fields in Chios and was released by importing *Rodalia cardinalis* Mustant (Coleoptera: Coccinellidae) from abroad in 1910 as a treatment (Bodenheimer 1953, Düzeş 1970). The same species was brought by Süreyya Özek who Türkiye's first Entomologist and lecturer, in 1922, and

was produced in Istanbul Halkalı Agricultural High School and used where necessary (Düzgüneş 1970). Özek & Hovasse (1928) published a study examining the damage of *Marchalina hellenica* Gennadius (Hemiptera: Marchalinidae) in the Istanbul Islands. During the War of Independence (1919-1922), silkworm production could not be made due to the heavy invasion of *Pseudaulacaspis pentagona* Targioni Tozzetti (Hemiptera: Diaspididae) on the mulberry trees around Bursa, and for the control ofthis pest, Bursa Sericulture Station Manager Tahir Yetmen founded in Florence in 1933 by *Encarsia (Prospaltella) berlesei* (Howard) (Hymenoptera: Aphelenidae) was brought and released (Bodenheimer, 1953). Invited as an "expert" by the Republic of Türkiye, Prof. F.S. Bodenheimer was personally between 1932 and 1934 where he constituted to the basic studies on scale insects in Türkiye (Bodenheimer 1941, 1949, 1952, 1953). Later, many researchers continued to work on the species, biology, hosts, distribution, damage and control of Turkish Scale Insects Özkök (1941), Schmitshek (1953), Düzgüneş (1952, 1957, 1969, 1970, 1982); Çanakçıoğlu (1977), Öncüer (1977), Selmi (1979), Yaşar (1990, 1991, 1995), Yaşar *et al.* 1995, Erler *et al.* (1996), Özkazanç & Yücel(1985), Önder *et al.* (2000). After specialization of Dr. Bülent Yaşar, Dr. Selma Ülgentürk (in the 1990s) and Dr.M. Bora Kaydan (in the 2000s) on Scale insects, the studies on this subject gained momentum (Kaydan 2011, 2014a,b, 2015;Kaydan *et al.* 2001a, b, 2002, 2004, 2005 a, b, 2008, 2013a,b, 2014a, b,c, 2015 a, b, Kaydan & Gavrilov 2010; Kaydan & Kozár 2008, 2010 a, b; 2011a,b; Kozár *et al.* 2013; Kaymak & Yaşar 2017; Ülgentürk 2002, 2015, 2016a,b; Ülgentürk & Toros 1996, 1999; Ülgentürk *et al.* 2001, 2003, 2009, 2012 a, b, 2013, 2014, 2016, 2019 a, b; Ülgentürk & Ayhan 2011, 2014, Ülgentürk & Kozar 2011, Ülgentürk & Mohammed 2016; Ülgentürk & Özdemir 2018). Öncüer *et al.* (2001) was presented 176 species of Coccoidea recorded from Türkiye,belonging to 13 families and 84 genera. After that Kaydan*et al.* (2013 a) listed 359 species belonging to 134 genera in 18 families. In the 15 years following this last study, many publications have been made and it has been determined that many invasive species have entered Türkiye, as well as the identification of many new speciesfor the world. On the other hand, in the light of recent studies in the world, there have been changes in the nameand location of many taxa. This situation has causedconfusion and mistakes in practice. As all over the world,Scalenet remains the main reference source for Scale Insects (Garcia Morales *et al.*, 2016). However, during the examinations made in Scalenet, there were many errors and deficiencies in the reports of Türkiye scale insect species. It is thought that this situation is due to the fact that the English reviews made by non-subject experts aretaken as a basis rather than the original Turkishpublications and the mistakes made in the compilations are repeated. For this reason, there was a need to reconsider and update the list of scale insects species in Türkiye. In this study, it is aimed to add new species to the list made by Kaydan *et al.* (2013), as well as to update the changed scientific names, their hosts and geographicaldistribution in Türkiye and present them to the information of relevant scientists and users.

Materials and Methods

Since the last scale insect list which was made by Kaydan *et al.* (2013), several studies on scale insects in Türkiye were carried out by Bolu (2018) Çiftçi & Bolu (2021), Elekçioğlu & Kaydan (2021), *Develioğlu* et al. (2018), Erözmen & Yaşar (2018), Kaydan (2014a, b, 2015 a, b), Kaydan *et al.* (2014a, b, c, d; 2021), Kaymaz & Yaşar, (2017), Keçe Çalışkan *et al*. 2015, Keçe Çalışkan & Ulusoy (2017); Kozár *et al.* (2013); Mohammed *et al.* (2016); Ülgentürk (2015, 2016a,b), Ülgentürk & Ayhan (2014); Ülgentürk & Mohammed (2016), Ülgentürk & Özdemir (2018), Ülgentürk *et al.* 2014a, b, 2016, 2019a, b), Yerlikaya *et al.* (2021). In thisstudy all these studies are rewieved and new records about of scale insects, their host plants and distributions added in the new list.

Results and Discussions

The insect species richness of Türkiye is always dynamic as a result of different climate characteristics of different sub-geographical regions in the country and it is thought that this dynamism will be continuing in future, for example, scale insect reaches over 409 species.

The evaluation of former and most recent data on scale insects in Turkiye, revealed that Diaspididae is the most species-rich family with 120 species in 46 genera, followed by the Pseudococcidae 120 species in 41 genera, and the Coccidae with 72 species in 30 genera. The other families have: Acanthococcidae (36 species, 12 genera), Asterolecaniidae (12 species, 4 genera), Dactylopiidae (1 species, 1 genus), Cerococcidae (2 species, 1 genus), Cryptococcidae (2 species, 2 genera), Eriococcidae (2 species, 1 genus), Kermesidae (12 species, 2 genera), Leconodiaspidae (1 species, 1 genus), Marchalinidae (2 species, 1 genus), Margarodidae (9 species, 2 genera), Matsucoccidae (2 species, 1 genus), Micrococcidae (1 species, 1 genus), Monophlebidae (3 species, 3 genera), Ortheziidae (3 species, 1 genus), Phoenicococcidae (1 species, 1 genus), Putoidae (4 species, 1 genus) and Rhizoecidae (5 species, 2 genera) (Table 1).

The species listed in Table 1 were organized according to their distributions with respect to 7 different regions in Türkiye known as Mediterranean Region (1), Eastern Anatolian Region (2), Aegean Region (3), South-East Anatolian Region (4), Black Sea Region (5), Marmara Region (6) and Central Anatolian Region (7).

As a result, even when only scale insects are considered, how rich Türkiye's biodiversity is has been revealed. Carrying out these studies with other orders and families will contribute to the planning of necessary methods for revealing Türkiye's biodiversity, taking measures for its protection, and the control of agriculturally important pests.

Table 1. Coccoidea (Hemiptera) species of Türkiye.

Species	Host plant	Distribution
ACANTHOCOCCIDAE		
Anophococcus		
1. *A. agropyri* (Borchsenius)	*Scabiosa* sp.	1
2. *A. cingulatus* Kiritchenko	*Stipa* sp.	7
3. *A. cynodontis* Kiritchenko	*Cynodon* sp., *Cynodon dactylon*	3, 6, 7
4. *A. herbaceus* (Danzig)	*Cynodon dactylon*	6, 7
5. *A. lerzanae* Kaydan & Kozár	*Bromus* sp.	2
6. *A. selmae* Kaydan & Kozár	*Phalaris* sp.	2
Acanthococcus		
7. *A. aceris* Signoret	*Quercus* sp., *Platanus orientalis*	2
8. *A. devoniensis* (Green)	*Erodium* sp., *Veronica multifida, Salvia* sp., *Acroptilon repens, Taraxacum* sp., *Achillea* sp., *Cichorium intybus*	2, 7
9. *A. greeni* (Newstead)	*Festuca* sp., *Agropyron* sp., *Poa* sp.	2, 7
10. *A. istresianus* (Goux)	*Helichrysum* sp., Asteraceae, *Cynodon* sp.	2
11. *A. insignis* Newstead	*Quercus* sp.	2
12. A. *kilinceri* Kaydan	*Quercus* sp.	6
13. *A. melnikensis* Hodgson and Trencheva	*Quercus* sp.	7
14. *A. roboris* Goux	*Quercus* sp.	2
15. *A. salicis* (Borchsenius)	*Salix alba*	2
16. *A. saxatilis* (Kritchenko)	*Euphorbia* sp., *E. sequieriana*	2
Borchseniococcus		
17. *B. duzgunesae* Kaydan& Kozár	*Panderia pilosa*	2
Gossyparia		
18. *G. spuria* (Modeer)	*Ulmus* sp.	1, 2, 6, 7
Kaweckia		
19. *K. vanensis* Kaydan	Poaceae	2
Kotejacoccus		
20. *K. turcicus* Kaydan & Kozár	*Quercus* sp.	2
Neoacanthococcus		
21. *N. atlihani* Kaydan & Kozár	*Tamarix* sp.	2
Orontesicoccus		
22. *O. lauri* Erkılıç	*Laurus nobilis*	1
Rhizococcus		
23. *R. astragali* Kaydan	*Astragalus* sp.	2
24. *R. evinae* Kaydan	*Euphorbia* sp.	2
25. *R. kondariensis* Borchsenius	*Agropyron repens*	2
26. *R. micracanthus* (Danzig)	*Salvia* sp., *Scabiosa* sp.	2, 6
27. *R. munroi* (Boratynsky)	*Minuartia anatolica, Crepis* sp.	7, 6
28. *R. nedimi* Kaydan	*Euphorbia* sp.	2
29. *R. pseudinsignis* Green	*Agropyron repens, Bromus* sp., *Bromus inermis, Cynodon dactylon, Dianthus crinitus*	7
30. *R. tavignani* Goux	Poaceae	2, 6
31. *R. terrestris* Matesova	*Medicago sativa*	2, 7
32. *R. thymi* (Schrank)	*Anchusa* sp., *Artemisia vulgaris, Centaura solstitialis,*	7
33. *R. variabilis* Goux	*Thymus* sp.	7
34. *R. zernae* (Tereznikova)	*Cynodon dactylon, Artemisia vulgaris, Agropyron* sp., *A. repens, Triticum orientalis*	7
Uhleria		
35. *U. araucariae* Maskell	*Araucaria* sp.	6
ASTEROLECANIIDAE		
Asterodiaspis		
36. *A. bella* (Russell)	*Quercus* sp.	2, 7
37. *A. hadzibeyliae* Borchsenius	*Quercus* sp.	7
38. *A. ilicicola* (Targioni Tozzetti)	*Quercus* sp., *Q. coccifera*	1, 3, 6
39. *A. mina* (Russell)	*Quercus* sp.	2
40. *A. minus* (Lindinger)	*Q. coccifera*	1, 3, 7
41. *A. quercicola* (Bouche)	*Quercus* sp., *Q. branti*	2
42. *A. repugnans* (Russell)	*Quercus* sp.	1, 2, 6
43. *A. variolasa* (Ratzeburg)	*Quercus* sp., *Q. aegilops, Q. coccifera*	7

Planchonia		
44. *P. arabidis* Signoret	*Crambe* sp.	7
45. *P. zanthenes* (Russel)	Unknown	Unknown
Pollinia		
46. *P. pollini* (Costa)	*Olea* sp., *O. europaea*	1, 3, 4
Rusulaspis		
47. *R. pustulans* (Cockerell)	*Nerium oleander*	1
CEROCOCCIDAE		
Cerococcus		
48. *C. perowskiae* Archangelskaya	*Artemisia* sp., *A. fragrans*	Unknown
49. *C polyporus* (Matesova)	*Thymus* sp.	5
CRYPTOCOCCIDAE		
Cryptococcus		
50. *C. fagisuga* Lindinger	*Fraxinus orientalis*	5
Pseudochermes		
51. *P. fraxini* (Kaltenbach)	*F. excelsior*	6
COCCIDAE		
Acanthopulvinaria		
52. *A. orientalis* (Nasonov)	*Noae* sp., *N. mucronata*	2, 7
Anapulvinaria		
53. *A. pistaciae* (Bodenheimer)	*Pistacia atlantica, P. terebinthus, P. vera*	1, 2, 4, 6, 7
Bodenheimera		
54. *B. rachelae* (Bodenheimer)	*Vitex agnus-castus*	1, 7
Ceroplastes		
55. *C. ceriferus* (Fabricius)	*Acer palmatum* cv *atropurpureum*	6
56. *C. floridensis* Comstock	Polyfag on ornamentals and fruits, *Cedrus libani*	1, 3
57. *C. japonicus* Green	*Acer negundo, A. pseudoplatanus, Aesculus hippocastaneum, Hedera helix, Laurus nobilis, Morus alba, Malus flibribunda, Nerium oleander, Pistaciae* sp., *Ulmus campastre*	6
58. *C. rusci* (Linnaeus)	Polyfag on ornamentals and fruits	1, 3
59. *C. sinensis* Del Guercio	Polyfag on ornamentals and fruits, *Actinidia deliciosa*	5
Coccus		
60. *C. hesperidum* Linnaeus	Polyfag on ornamentals and fruits, *Cedrus libani, Pinus* sp., *Picea orientalis*	1, 5, 6, 7
61. *C. pseudomagnoliarum* (Kuwana)	Polyfag on ornamentals and fruits	1, 2, 3, 6,7
Didesmococcus		
62. *D. unifasciatus* (Archangelskaya)	*Prunus persicae*	2
Eriopeltis		
63. *E. festucae* (Boyer de Fonscolombe)	*Alopecurus myosuroides, Agropyron* sp., *A. repens, Festuca* sp.	2, 7
Eucalymnatus		
64. *E. tessellatus* (Signoret)	*Phoenix* sp.	7
Eulecanium		
65. *E. ciliatum* (Douglas)	*Jasminum fruticans, Acer campestre, A. pseudoplatanus, Crataegus monogyna, C. oxycantha., Ribes* sp., *Cydonia* sp.	7
66. *E. cerasorum* (Cockerell)	*Malus* sp.	7
67. *E. ficiphilum* Borchsenius	*Quercus* sp., *Q. robor*	2
68. *E. pistaciae* Borchsenius	*Ficus carica*	2
69. *E. rugulosum* (Archangelskaya)	*Pistacia* sp.	1
70. *E. sericeum* Lindinger	*Prunus persica*	2, 5
71. *E. takachihoi* (Kuwana)	*Abies cilicica, A. bornmuelleriana*	1
72. *E. tiliae* (Linnaeus)	*Vitex agnus-castus*	1, 2, 6, 5, 7
73. *E. transvittatum* (Green)	Polyfag on ornamental and fruits *Acer negundo*	7
Exaeretopus		
74. *E. agropyri* (Hadzibejli)	*Poa bulbosa*	7
75. *E. formiceticola* Newstead	*Aegilops* sp., Poaceae	2, 7
76. *E. tritici* Williams	*Bromus tectorum, Triticum vulgare*	2, 7
Filippia		
77. *F. follicularis* (Targioni Tozzetti)	*Fraxinus* sp., *Jasminium* sp., *Olaea* sp., *Olea europaea, Phyllyrea* sp., *Pyrus communis, Viburnum* sp., *Viscum album*	1, 3, 4, 6,7

Lecanopsis		
78. *L. turcica* (Bodenheimer)	*Agropyron* sp.	7
79. *L. subterranea* (Gomez-Menor Ortega)	Poaceae	2
80. *L. taurica* Borchsenius	Poaceae	2
Lichtensia		
81. *L. viburni* Signoret	*Viburnum* sp., *V.iburnum tinus, Hedera helix, Olea oleaster, Phillyrea* sp.	3, 6
Luzulaspis		
82. *Luzulaspis filizae* Kaydan	*Carex* sp.	1
Nemolecanium		
83. *N. aptii* (Bodenheimer)	*Abies nordmanniana*	5
84. *N. abietis* Borchsenius	*Abies bornmuelleriana, A. nordmanniana*	5, 7
Neopulvinaria		
85. *N. innumerabilis* (Rathvon)	*Acer negundo, Catalpa bignonioides, Crateagus monagyna, Morus alba, Quercus* sp., *Parthenocissus quinquefolia, P. quinquefolia, Robinia pseudoacacia, Spiraea* sp., *Tilia* sp., *Vitis vinifera*	6, 7
Palaeolecanium		
86. *P. bituberculatum* (Signoret)	Ployfag on Rosaceae	1, 2, 4, 6, 7
87. *P. kosswigi* Bodenheimer	*Pyrus elaeagnifolia*	4
Parasaissetia		
88. *P. nigra* (Nietner)	*Myrtus communis*	1
Parthenolecanium		
89. *P. corni* (Bouché)	Polyfag on fruits, *Morus alba, Robinia pseudoacacia Vitis vinifera, Morus alba, Prunus armeniaca, Prunus persicae, Elaeganus* sp.	2, 3, 5, 6, 7
90. *P. persicae* (Fabricius)	Stone fruits	6, 7
91. *P. pomeranicum* (Kawecki)	*Taxus buccata*	3, 6
92. *P. pruinosum* (Coquillett)	*Philadelphus corenarius*	Unknown
93. *P. rufulum* (Cockerell)	*Quercus* sp. *Q. rubra*	6, 7
94. *P. tamaricis* (Bodenheimer) *	*Tamarix pallasii*	7
Physokermes		
95. *P. piceae* (Schrank)	*Abies bornmuelleriana, Picea pungens, P. abies* (*P.excelsa*)	6, 7
96. *P. hellenicus* Kozár and Gounari	*Abies bornmuelleriana, A. cilicica*	1, 5, 7
Poaspis		
97. *Poaspis intermediata* Goux	*Pinus brutia*	6
Pulvinaria		
98. *P. floccifera* (Westwood)	Polyfag on ornamental and fruits	1, 5, 6
99. *P. terrestris* Borchsenius	*Crataegus* sp.	7
100. *P. tremulae* Signoret	*Populus* sp.	2
101. *P. vitis* (Linnaeus)	*Cydonia oblonga, Malus communis, Quercus* sp., *Platanus orientalis, Prunus armeniaca, Pyrus communis, Rosa* sp., *Salix* sp., *Ostrya carpinifolia, Vitis* sp., *V. vinifera*	2, 3, 6, 7
102. *Pulvinaria peregrina* (Borchsenius)	*Hibiscus* sp.	5
Pulvinariella		
103. *P. mesembryanthemi* (Vallot)	*Aptenia cordifolia, Carpobratus aciniformis*	3, 7
Rhizopulvinaria		
104. *R. artemisiae* (Signoret)	*Acantholimon echinus, Acanthophyllum* sp., *Artemisia* sp., *Cerastium* sp., *Dianthus* sp., *Gypsophila* sp., *Scutellaria* sp., *Teucrium polium,* Crucifera	2, 7
105. *R. dianthi* (Bodenheimer)	*Artemisia* sp., *Astragalus* sp., Caryophyllaceae, Crasullaceae	2
106. *R. grandicula* Borchsenius	*Acantholimon* sp., *Achillae* sp., *Artemisia vulgaris, Comphorosoma* sp., *Eryngium campastre, Helychrysum* sp.,	2
107. *R. hissarica* Borchsenius	Hypericaceae	2
108. *R. halli* Borchsenius	*Dianthus* sp.	7
109. *R. megriensis* Borchsenius	*Pyrethrum* sp., *Tanacetum* sp., *Alyssum* sp., *Silene* sp.	2
110. *R. pyrethri* Borchsenius	*Silene* sp., Primulaceae, *Acantholimon* sp., *Artemisia* sp., *Alyssum* sp., *Dianthus* sp., *Veronica multifida*	2, 7
111. *R. spinifera* Borchsenius	*Jasminum* sp., *J. fructicans, Veronica* sp., *Thymus* sp., *Alyssum* sp.	7
112. *R. turkestanica* (Archangelskaya)	*Artemisia* sp., *Dianthus* sp., Rubiaceae	2, 7
113. *R. turkmenica* Borchsenius	*Buplerum* sp., *Dianthus* sp.,*Veronica* sp., Boraginaceae	2
114. *R. variabilis* Borchsenius	Lamiaceae	2
115. *R. viridis* Borchsenius	*Artemisia vulgaris, Verbascum* sp., Brassicaceae *Dianthus* sp.	2

Rhodococcus		
116. *R. perornatus* (Cockerell & Parrott)	*Rosa* sp., *R. cinnamomea, R. canina, R. damascena, Rosa pimpinellifolia*	1, 3, 7
117. *R. turanicus* Archangelskaya	*Prunus domestica, Prunus armeniaca*	2
Saissetia		
118. *S. coffeae* (Walker)	Polyfag on ornamental plants and fruits	5, 6, 7
119. *S. oleae* (Olivier)	*Olea* sp., *Cycas evolute, Tamarix* sp.	1, 3, 4, 6
Scythia		
120. *S. craniumequinum* Kiritchenko	*Agropyron* sp., *Festuca* sp.	7
121. *S. festuceti* Šulc	*Festuca* sp., Poaceae	2
Sphaerolecanium		
122. *S. prunastri* (Boyer de Fonscolombe)	Stone fruits	1, 2, 3, 5, 6, 7
Vittacoccus		
123. *Vittacoccus longicornis* (Green)	In the soil	2
DACTYLOPIIDAE		
Dactylopius		
124. *D. coccus* Costa	*Opuntia ficus-indica*	1
DIASPIDIDAE		
Abgrallaspis		
125. *A. cyanophylli* (Signoret)	*Brasiliopuntia brasiliensis, Chamacerasus silvestri, Cactus* spp. *Dianthus caryophyllus, Senecio bicolor, Gasteria maculata (=Gasteria bicolor var. bicolor), G. verrucosa (=G. carinata var. verrucosa*)	3, 6, 7
Acanthomytilus		
126. *A. sacchari* (Hall)	*Sorghum halepense*	1, 4
Aonidia		
127. *A. lauri* (Bouche)	*Laurus nobilis*	1, 4, 6
128. *A. mediterranea* (Lindinger)	*Cupressus sempervirens, Juniperus* sp., *P. brutia*	1
Aonidiella		
129. *A. aurantii* (Maskell)	*Acacia* spp., *Citrus* spp., *Rosa* spp., *Amaranthus viridis*	1, 3
130. *A. citrina* (Coquillett)	*Acacia cultiformis, Catalpa bignonioides, Ceratonia siliqua, Citrus* spp., *Elaeagnus angustifolia, Hedera helix, Euonymus* spp., *Jasminum* spp., *Vitis vinifera, Rosa* spp.	1, 3
Aspidiotus		
131. *A. hedericola* Leonardi	*Laurus nobilis, Hedera helix*	1, 3, 6
132. *A. nerii* Bouche	*Acacia cultiformis, A. cyanophilla, Aucuba japonica, Asparagus acutiformis, Campsis radicans, Canna indica, Cedrus libani. Citrus limon, Cycas revoluta, Hedera helix, Jasminum* sp., *Laurus nobilis*	1, 3, 5, 6
Aulacaspis		
133. *A. rosae* (Bouché)	*Rosa* sp., *Rubus fruticasus*	1, 5, 6
134. *A. yasumatsui* Takagi	*Cycas revoluta*	1
Batarasa		
135. *Batarasa lumampao* Takagi	*Bambusa siamensis*	7
Carulaspis		
136. *C. juniperi* (Bouché)	*Cupressus sempervirens, Juniperus excelsa, Platycladus orientalis (=Thuja orientalis)*	1, 3
137. *C. minima* (Signoret)	*Arceuthos drupacea, Chamaecyparis lawsoniana, Cupressus arizonica, Juniperus communis, Platycladus orientalis (=Thuja orientalis)*	1, 6
Chlidaspis		
138. *C. asiatica* (Archangelskaya)	*Prunus communis* (*=P. domestica*)	1
Chionaspis		
139. *C. austriaca* Lindinger	*Pinus* sp.	2
140. *C. etrusca* Leonardi	*Tamarix* sp., *T. pallasii* (*=T. laxa*)	1, 2, 3, 5, 7
141. *C. kabyliensis* Balachowsky	*Cedrus libani*	1, 7
142. *C. lepineyi* Balachowsky	*Quercus* sp.	2
143. *C. salicis* (Linnaeus)	*Populus alba, P. canadensis, P. nigra, P. tremuloides, Salix alba, S. babylonica, Ulmus* sp.	1, 2, 3, 5, 7

Chrysomphalus		
144. *C. aonidum* (Linnaeus)	*Citrus limon, C. sinensis*, Palmae, *Aloe* sp., *Persea americana*	3, 5, 7
145. *C. dictyospermi* (Morgan)	*Aralia* spp., *Buxus microphylla, Citrus aurantium, C. bigaradia, C. limon, C. sinensis, Ceratonia siliqua, Dracena* spp., *D. deremensis, Eriobotrya japonica, Senecio bicolor, Persea americana*	1, 3, 5
146. *C. pinnulifer* (Maskell)	*Euonymus japonica, Ficus carica, Taxus* sp.	1, 3, 5
Contigaspis		
147. *C. zillae* (Hall)	*Acantholium* sp., *Artemisia* sp., *Gallium* sp., Compositae	2, 4
Chortinaspis		
148. *C. subterranea* (Lindinger)	*Agropyron* sp.	7
Diaspidiotus		
149. *D. anatolicus* (Bodenheimer)	*Prunus dulcis (=Prunus amygdalus, =Amygdalus communis) Amygdalus* spp.	7
150. *D. armenicus* (Borchsenius)	*Populus alba, P. nigra, Salix* sp., *Ulmus* sp.	2, 5
151. *D. caucasicus* (Borchsenius)	*Populus* sp., *P. nigra* v. *pyramidalis, Salix* sp., *Quercus* sp.	2, 5, 6, 7
152. *D. distinctus* (Leonardi)	*Ephedra campylopoda*	1
153. *D. elaeagni* (Borchsenius)	*Astragalus* sp.	7
154. *D. gigas* (Thiem & Gerneck)	*Populus* sp., *Salix* sp.	2, 5, 6
155. *D. jaapi* (Leonardi)	*Cedrus libani, Pinus brutia*	1, 3
156. *D. kaussarii* Balachowsy	*Salix alba*	2
157. *D. lenticularis* (Lindinger)	*Prunus avium*	6
158. *D. marani* (Zahradník)	*Fraxinus* sp., *Fraxinus excelsior, Malus sylvestris, Platanus orientalis, Prunus domestica, Pyrus communis*	1, 2, 5, 6, 7
159. *D. osborni* (Newell & Cockerell)	*Salix* sp., *Prunus domestica*	4
160. *D. ostreaeformis* (Curtis)	*Populus nigra, Salix* sp. *Pistacia* sp.	2, 3, 5, 6, 7
161. *D. perniciosus* (Comstock)	Polyfag on ornomentals and fruits	1, 2, 5, 7
162. *D. prunorum* (Laing)	*Prunus armeniaca, P. domestica*, *P. dulcis*	2
163. *D. pyri* (Lichtenstein)	*Malus sylvestris, Salix* spp.	2, 5, 6, 7
164. *D. sulci* (Balachowsky)	*Ephedra* sp.	2, 7
165. D. *transcaspiensis* (Marlatt)	*Salix* sp.	2
166. *D. uvae* (Comstock)	*Celtis siliquasrum* L., *F. excelsior, P. orientalis, Paulownia tomentosa, Jacaranda mimosifolia, R. Pseudoacacia Alnus* sp.	1
167. *D. wuenni* (Lindinger)	*Quercus* sp.	7
168. *D. zonatus* (Frauenfeld)	*Fagus orientalis, Juglans regia, Salix* spp., *Ulmus americana*	2, 5, 7
Discodiaspis		
169. *D. salicorniae* (Gómez-Menor Ortega)	Unknown	2
Diaspis		
170. *D. boisduvalii* Signoret	*Orchis* sp., Palmae	7
171. *D. bromeliae* (Kerner)	*Orchis* sp.	7
172. *D. echinocacti* (Bouché)	*Cactus* sp., *Opuntia ficus-indica*	1, 7
173. *D. syriaca* Lindinger	*Pistacia terebinthus, P. vera*	1
Duplachionaspis		
174. *D. berlesii* (Leonardi)	*Artrocnemum glaucum*	1
175. *D. erianthi* Borchsenius	*Sorghum halepense*	1, 4
176. *D. natalensis* (Maskell)	*Phragmites australis*	1
177. *D. noaeae* (Hall)	*Noaea* sp., *N. mucronata*	2, 7
Dynaspidiotus		
178. *D. abieticola* (Koroneos)	*Abies bornmülleriana, Cedrus libani*	7
179. *D. abietis* (Schrank)	*Abies* sp., *Pinus* sp.	7, 5, 6
180. *D. atlanticus* (Balachowsky)	*Olea europea*	1
181. *D. britannicus* (Newstead)	*Cedrus libani, Ceratonia siliqua, Daphne* sp., *Hedera helix, Laurus nobilis, Olea europaea, Myrtus communis, Pistacia lentiscus*	1, 3, 5, 6, 7
Epidiaspis		
182. *E. gennadii* (Leonardi)	*Pistacia* sp.	1, 4, 5, 7
183. *E. leperii* (Signoret)	*Pistacia* sp., *Prunus* sp., *P. domestica*, *Aesculus hippocastaneum*	1, 4, 5, 6, 7
184. *E. salicis* (Bodenheimer)	*Salix* sp.	2

Fiorinia		
185. *F. fioriniae* (Targioni Tozzetti)	*Livistona chinensis, Palmae* sp., *Phoenix* spp., *Ruscus hypoglossum*	1
Furchadaspis		
186. *F. zamiae* (Morgan)	*Bricardia vinicera, Cycas revoluta*, Palmae	6
Gomezmenoraspis		
187. *G. pinicola* Leonardi	*Pinus brutia, P. halepensis, P. pinea*	1, 3, 5, 6
188. *G. nr. pinicola* (Leonardi)	*Cedrus libani*	1, 7
Genistaspis		
189. *G. zelihae* Bodenheimer	*Genista joubertii inops*	7
Gonaspidiotus		
190. *G. minimus* (Leonardi)	*Quercus coccifera, Q. dschrochensis, Q. ilex*	1, 3, 6
191. *G. seurati* (Marchal)	*Thuja* sp.	Unknow
Hemiberlesia		
192. *H. lataniae* (Signoret)	*Prunus dulcis (=Prunus amygdalus = Amygdalus communis), Strelitzia* sp., *Olea europae*	3, 6
193. *H. rapax* (Comstock)	*Actinidia deliciosa, Euonymus japonica*	3, 5, 6
Kuwanaspis		
194. *K. pseudoleucaspis* (Kuwana)	*Bambusa* sp.	6
Lepidosaphes		
195. *L. beckii* (Newman)	*Citrus* spp. *Malus sylvestris??*	1, 3, 7
196. *L. conchiformis* (Gmelin)	*Ficus carica*, Lamiaceae., *Rhammus* spp., *Ulmus* spp.	1, 3
197. *L. gloverii* (Packard)	*Citrus aurantium, C. limon, C. sinensis*	1, 3, 5
198. *L. granati* Koroneos	*Acacia cultriform, Celtis* sp., *Ficus carica, Platanus orientalis, Punica granatum, Ulmus* sp., *U. glabra*	1, 2
199. *L. juniperi* Lindinger	*Cedrus libani, Pinus nigra, Thuja occidentalis*	3, 5, 6, 7
200. *L. malicola* Borchsenius	*Acer negundo, Fraxinus excelsior, Malus communis, Populus* sp. *Prunus* sp., *P. armeniaca, P. serrulata, Pyrus communis, Juglans regia, Salix* sp.	2, 7
201. *L. newsteadi* (Šulc)	*Abies bornmuelleriana, A. pinsapo, Picea pungens*	6, 7
202. *L. pinnaeformis* (Bouché)	Poyfag on ornamentals and fruits	1, 4
203. *L. pistaciae* Archangelskaya	*Malus sylvestris, Pistacia lentiscus, P. tenebinthus, P. vera*	2, 3, 4, 5
204. *L. serrifrons* (Leonardi)	Unknow	3
205. *L. ulmi* (Linnaeus)	*Acer negundo, Bauhinia* sp., *Cotoneaster horizontalis, Crateagus sp., Juglans regia, Malus* sp., *M. communis, Pyrus communis, Quercus* sp., *Rosa canina, R. domascena, Salix* sp., *Syringa vulgaris, Vitis vinifera, P. brutia*	1,2, 3,4,5, 6, 7
Leucaspis		
206. *L. knemion* Hoke	*Pinus* sp., *P. silvestri*	4, 6
207. *L. lowi* Colvée	*Pinus* sp., *P. nigra*	1, 2, 3, 5, 6, 7
208. *L. pini* (Hartig)	*Cedrus libani, Olea europea, Pinus pinea, P. brutia*	1, 3, 6, 7
209. *L. pusilla* Löw	*Cedrus* spp., *Pinus* sp. *P. brutia, P. halepensis, P. pinea*	1, 3, 6, 7
210. *L. riccae* Targioni Tozzetti	*Ephedra* spp., *Euphorbia* spp. ,*Olea europea*	1, 4
Lineaspis		
211. *L. striata* (Newstead)	*Thuja* spp., *T. occidentails, Cupressus* sp., *C. sempervirens, Arceuthobium* sp.	1
212. *L.* nr. *striata* (Newstead)	*Juniperus* sp.	2
Lopholeucaspis		
213. *L. japonica* (Cockerell)	*Citrus* sp.	5
Melanaspis		
214. *M. inopinata* (Leonardi)	*Arbutus unedo, Bauhinia* sp., *Celtis* sp., *Cercis siliquastrum, Malus communis, Prunus* sp., *P. avium, Pyrus communis, Astragalus* sp.	1, 2, 7
Mercetaspis		
215. *M. halli* (Green)	*Astragalus* spp?? (Probably this record is *M. sureyyanus*), *Prunus armeniaca, Prunus domestica, P. armeniaca,*	1, 2, 4, 7
216. *M. sureyanus* (Bodenheimer)	*Astragalus* sp.	2, 7
Mohelnaspis		
217. *M. massiliensis* (Goux)	*Alopecurus myosuroides, A. agrestis, Cynodon* sp.	7
Oceanaspidiotus		
218. *O. spinosus* (Comstock)	*Viburnum tinus*	1
Odonaspis		
219. *O. greeni* Cockerell	*Bambusa siamensis*	7
220. *O. serrata* Ben-Dov	*Bambusa siamensis*	7

Parlatoria		
221. *P. crotonis* Douglas	*Citrus* sp.	1, 2, 7
222. *P. oleae* (Colvée)	*Eriobotrya* sp., *Fraxinus* sp., *Rosa* sp., *Malus sylvestris*, *Prunus* spp., *Syringa vulgaris*	1, 2, 3, 4, 6, 7
223. *P. parlatoriae* (Šulc)	*Abies bornmülleriana*	5, 7
224. *P. pergandii* Comstock	*Citrus* spp., *Malus sylvestris*	1, 2
225. *P. ziziphi* (Lucas)	*Asparagus* spp., *Citrus* spp.	1, 2
Parlatoreopsis		
226. *P. longispina* (Newstead)	*Acacia cultiformis*, *Acer rubrum*, *Orchis* spp., *Celtis* sp.	1
Pinnaspis		
227. *P. aspidistrae* (Signoret)	*Asplenium* spp., *Aspidistra elatior*	6
Pseudaulacaspis		
228. *P. pentagona* (Targioni Tozzetti)	Polyfag on ornamental and fruit plats, *Actinidia deliciosa*	1, 2, 5, 6, 7
Prodiaspis		
229. *P. tamaricicola* (Malenotti)	*Tamarix pallasii* (=*T. laxa*), *T. pentandra*	2, 3, 7
Poliaspiodes		
230. *P. bambusae* Ulgentürk & Pellizari	*Bambusa* sp.	2
Rhizaspidiotus		
231. *R. balachowskyi* Kozar & Matile-Ferrero	Poaceae	2
232. *R. bivalvatus* Goux	*Artemisia* sp.	2
233. *R. canariensis* (Lindinger)	*Circium arvense*	7
234. *R. donacis* (Leonardi)	*Phragmites australis*	1
Salicicola		
235. *S. archangelskyae* (Lindinger)	*Fraxinus excelsior*, *Olea europea*, *Quercus* sp., *Prunus avium*, *P. armeniaca*, *P. domestica*, *Crateagus* sp., *Pyrus communis*, *P. pyraster*	1, 5, 7
236. *S. davatchi* Balachosky & Kaussari	*Pistacia terebinthus*, *Pistacia vera*	2
237. *S. kermanensis* (Lindinger)	*Salix alba*, *Populus* sp., *P. nigra*	1, 2
238. *S. pistaciae* (Lindinger)	*Pistacia* spp., *P. lentiscus*	1, 3, 4
Targionia		
239. *T. nigra* Signoret	*Gleditschia* spp.	1
240. *T. porifera* (Borchsenius)	*Panderia pilosa*	2
241. *T. vitis* (Signoret)	*Aesculus hippocastaneaum*, *Castanea crenata*, *Vitis vinifera*, *Quercus* sp.	1, 6, 7
Torosaspis		
242. *T. cedricola* Balachowsky & Alkan	*Cedrus* sp., *C. libani*	2, 3, 4, 6, 7
243. *T. turcica* Ülgentürk & Kozár	*Pinus brutia*	1
Unaspis		
244. *U. euonymi* (Comstock)	*Buxus sempervirens*, *Rosa* spp., *Eunoymus argentata*, *E. japonicus*	1, 2, 5, 6, 7
ERIOOCCIDAE		
Eriococcus		
245. *E. buxi* (Boyer de Fonscolombe)	*Buxus sempervirens*	5, 6
246. *E. williamsi* Danzig	*Buxus* sp.	5
KERMESIDAE		
Kermes		
247. *K. bekiri* Bodenheimer	*Quercus aegilops*	3
248. *K. bacciformis* Leonardi	*Quercus* sp.	1
249. *K.* nr. *bacciformis*	*Quercus* sp.	2
250. *K. greeni* Bodenheimer	*Quercus coccifera*	1, 3
251. *K. hermonensis* Spodek & Ben-Dov	*Quercus infectoria*	4
252. *K. muhlisi* Bodenheimer	*Quercus* sp.	1
253. *K. roboris* (Fourcroy)	*Quercus* sp.	2
254. *K. sadrii* Bodenheimer	*Quercus aegilops*	2
255. *K. safinazae* Ozkok	*Quercus* sp., *Q. cerris*	1
256. *K. vermilio* Planchon	*Quercus coccifera*, *Q. ilex*, *Q. suber*	1, 3, 7
Nidularia		
257. *N. balachowskii* Bodenheimer	*Quercus* sp.	4
258. *N. pulvinata* (Planchon)	*Quercus* sp., *Q. coccifera*, *Q. ithaburensis*	Unknow

LECANODIASPIDIDAE		
Lecanodiaspis		
259. *L. sardoa* Targioni Tozzetti	*Cistus* sp., *Cistus albida*	3, 6
MARGARODIDAE		
Neomargarodes		
260. *N. festucae* Archangelskaya	*Festuca* spp., *F. ovina*	7
261. *N. aristidae* Borchsenius	Poaceae, *Bromus* sp., *Stipa* sp.	2
262. *N. setosus* Borchsenius	Poaceae, *Stipa* sp.	2
Porphyrophora		
263. *P. hamelii* Brandt	*Cynodon* sp.	2
264. *P. minuta* Borchsenius	*Diplotaxis tenuifolia, Cardaria draba*	7
265. *P. tritici* (Bodenheimer)	Poaceae	4, 7, 2
266. *P. polonica* (Linnaeus)	*Lens culinaris*	4
267. *P. jashenkoi* Vahedi	Poaceae	2
268. *P. jakubskii* Vahedi	Poaceae	2
MARCHALINIDAE		
Marchalina		
269. *M. hellenica* (Gennadius)	*Pinus brutia, P. halepensis, P. pinae, P. silvestris*	1, 3, 6
270. *M. caucasica* Hadzibejli	*Abies nordmanniana, Piceae orientalis*	5
MATSUCOCCIDAE		
Matsucoccus		
271. *M. josephi* Bodenheimer & Harpaz	*Pinus* sp., *P. brutia, P. pinea*	1, 3
272. *M. pini* Green	*Pinus* sp., *P. sylvestris*	1, 3, 7
MONOPHLEBIDAE		
Gueriniella		
273. *G. serratulae* (Fabricius)	*Cichorium intybus*	1, 3, 6, 7
Icerya		
274. *I. purchasi* Hempel	Polyfag on ornamental plats	1, 3, 5, 6
Palaeococcus		
275. *P. fuscipennis* (Burmeister)	*Pinus* sp., *P. brutia*	1, 3, 6
MICROCOCCIDAE		
Micrococcus		
276. *M. similis* Leonardi	Poaceae	6
ORTHEZIIDAE		
Orthezia		
277. *O. urticae* (Linnaeus)	Polyfagus	1, 6, 7
278. *O. maroccana* Kozár & Konczné Benedicty	*Astragalus sp.*, *Gallium* sp., *Eryngium campastre, Noneae* sp., *Thymus* sp.	2
279. *O. yashushii Kuwana*	*Astragalus* sp., *Thymus* sp.	2
PHOENICOCOCCIDAE		
Phoenicococcus		
280. *Phoenicococcus marlatti* Cockerell	*Phoenyx dactylifera*	1
PSEUDOCOCCIDAE		
Antonina		
281. *A. graminis* (Maskell)	*Festuca* sp., Poaceae	2, 7
Artemicoccus		
282. *A. bispinus* (Borchsenius)	*Artemisia* sp.	7
Atrococcus		
283. *A. arakelianae* (Ter-Grigorian)	*Salvia* sp., *Matricaria* sp.	2
284. *A. achilleae* (Kiritchenko)	Compositae, *Acantholimon* sp., *Centaurea* sp., *Melilotus alba, Ranunculus* sp., *Scabiosa* sp., *Scolzonera* sp., *Sideritis* sp., *Stachys* sp., *Verbascum* sp., *Veronica* sp., *V. multifida*	7
285. *A. ater* Goux	*Seteria* sp.	7
286. *A. cracens* Williams	*Centaurea* sp., *Medicago sativa*, Chenapodiaceae, Fabaceae.	2
287. *A. indigens* (Borchsenius)	*Astragalus* sp.	2
288. *A. paludinus* (Green)	*Teucrium* sp., *Senecio* sp., *Centaurea* sp.	7
289. *A. parvulus* (Borchsenius)	*Artemisia* sp., *Digitalis* sp., *Euphorbia* sp., *Galium* sp., *Verbascum* sp.	2
290. *A. saxatilis* (Ter-Grigorian)	*Salvia* sp., Asteraceae, *Phlomis* sp., *Salvia* sp., Caryophyllaceae	2, 7

Bromusicoccus		
291. *B. gulsunae* Kaydan	*Bromus* sp.	2
Ceroputo		
292. *C. pilosellae* Šulc	*Euphorbia* sp., *E. sequieriana, Heliotrophium europium, Sanguisorba minor, Salvia* sp.	1, 2, 7
Chaetococcus		
293. *C. bambusae* (Maskell)	*Bambusa* sp.	5, 7
294. *C. phragmitis* (Marchal)	*Phragmites* sp.	2, 7
Chorizococcus		
295. *C. rostellum* (Lobdell)	Poaceae, *Setaria viridis*	1
Coccidohystrix		
296. *C. artemisiae* (Kiritchenko)	*Artemisia* sp.	7
297. *C. zsuzsannae* Kaydan	Asteraceae	2
Coccura		
298. *C. circumscripta* (Kritchenko)	Unknown	2
299. *C. comari* (Kunow)	*Sanguisorba minor*	5
Crisicoccus		
300. *C. matesovae* (Danzig)	*Juniperus* sp.	2
Dysmicoccus		
301. *D. brevipens* (Cockerell)	*Ananas comosus*	2
Euripersia		
302. *E. amnicola* Borchsenius	*Festuca* sp., *Hordeum* sp., *Stipa* sp., *S. holosteta*, Juncacceae, Poaceae	2
Erimococcus		
303. *Erimococcus ozani* Kaydan	*Suaeda* sp.	2
Fonscocolombia		
304. *F. europaea* (Newstead)	Unknown	2
305. *F. ulusoyi* Kaydan	*Stipa* sp. -*Festuca* sp. *(Poaceae)*	2
Heliococcus		
306. *H. bohemicus* Šulc	*Phlomis* sp.	2
307. *H. glacialis* (Newstead)	*Medicago* sp.	2
308. *H. radicicola* Goux	*Dianthus* sp., *Achillea millefolium, Aethionema arabicum, Condrilla* sp., *Carduus pycnocephalus, Daucus* sp., *Diplotaxis tenuifolia, Erodium* sp., *Eryngium campestre, Lactuca* sp., *L. seriola, Malva* sp., *Sisymbrium* sp., *Stachys* sp., *Verbascum* sp., Asteraceae, Compositae,	2, 7
309. *H. saxatilis* Borchsenius	*Nepeta* sp., *Carduus pycnocephalus*	2
310. *H. sulcii* Goux	*Marribium* sp.	7
Heterobrevennia		
311. *H. gullanae* Kaydan	Poaceae	2
312. *H. kozari* Kaydan	*Cynodon dactylon*	2
313. *H. opertus* Borchsenius	*Agropyron repens, Cynodon dactylon*	2, 7
Heterococcus		
314. *H. nudus* (Green)	*Agropyron* sp., *A. repens, Echinocloa crus-galli, Festuca arundinaceae, F. rubra, Hordeum murinum, Lolium* sp., *L. perenne, Seteria* sp., *S. viridis, Sorghum* sp., *Stipa* sp., Poaceae	2, 7
315. *H. tritici* (Kiritshenko)	*Avena* sp., *Cynodon dactylon, Elymus caput-medusae*	7
Longicoccus		
316. *L. affinis* (Ter-Grigorian)	*Hordeum bulbosa, Agropyron repens*	2, 7
317. *L. clarus* (Borchsenius)	*Cynodon dactylon*, Poaeceae	2, 7
318. *L. festucae* (Koteja)	*Poa pratensis, Stipa* sp.	7
319. *L. longiventris* (Borchsenius)	*Hordeum bulbosa, Poa pratensis*	7
320. *L. psammophilus* (Koteja)	*Aegilops* sp., *Agropyron repens, Hordeum murinum, Poa bulbosa*	7

Metadenopus		
321. *M. ankaranus* (Bodenheimer)	*Festuca ovina*	7
322. *M. festucae* Šulc	Poaceae	2
323. *M. halogetonis* Matesova	Unknown	2
Mirococcopsis		
324. *M. ammophila* Bazaraov&Nurmamatov	Brassiceae, *Thymus* sp. *Papaver* sp.	2
325. *M. avetianae* ter-Grigorian	Poaceae	2
326. *M. elongatus* Borchsenius	*Festuca* sp., *Stipa* sp.	7
327. *M. multicircularia* Kaydan &Gavrilov	Poaceae	2
328. *M. subalpina* (Danzig)	Poaceae	2
329. *M. teberdae* (Danzig)	Poaceae	2
Mirococcus		
330. *M. inermis* (Hall)	*Polygonum* sp., *Salsola kali*, *Amaranthus viridis, Atriplex* sp., *Cardaria draba, Chenopodium* sp., *C. album, Diplotaxis tenuifolia, Heliotropium europaeum, Polygonum aviculare, Sinapis arvensis, Sisymbrium altissimum, Xanthium strumarium*	2
Neotrionymus		
331. *N. monstatus* Ter-Grigorian	*Phragmites* sp., *Phragmites communis*	2, 7
Nipaecoccus		
332. *N. viridis* (Newstead)	*Robinia pseudacacia*	6
333. *N. nipae* (Maskell)	Polyfag on fruit plats	6
334. *N. delassusi* (Balachowsky)	*Erica australis*	5
Palmicultor		
335. *P. palmarum* (Ehrhorn)	*Washingtonia* sp.	3
Pararhodania		
336. *P. armema* Ter-Grigorian	*Achillea* sp. *Taraxanum* sp.	
Peliococcopsis		
337. *P. priesneri* (Laing)	*Cynodon dactylon*	2, 7
Peliococcus		
338. *P. agriensis* Kaydan	*Asteraceae*	2
339. *P. kimmericus* (Kiritshenko)	*Cuminum cyminum*	2, 7
340. *P. chersonensis* (Kiritshenko)	*Artemisia* sp., *A. fragrans, A. vulgaris, Globularia* sp., *Solanum tuberosum, Cardaria draba, Sinapis arvensis, Tragopogon* sp., *Veronica* sp.	2, 7
341. *P. salviae* Hadzibejli	*Carduus* sp., *Phlomis* sp., Crucifera	2, 7
342. *P. turanicus* (Kiritshenko)	*Achillea* sp., *A. millefolium, Artemisia* sp., *Cardaria* sp., *C draba, Crepis* sp., *Cichorium* sp., *C. intybus, Convolvulus arvensis, Descuarinia sophia, Diplotaxis tenuifolia, Euphorbia* sp., *Falcaria vulgaris, Medicago* sp., *Salvia* sp., *Senecio* sp., *Scolzenera* sp., *Sisymbrium* sp., *Sonchus* sp., *S. arvensis, Tragopogon* sp., *Turgenia latifolia, Xanthium strumarium* sp.	2
Pelionella		
343. *P. kansui* Kaydan	Roots of *Salvia* sp., *Elytrigia repens* and some undetermined plant species	2
344. *P. manifecta* Borchsenius	*Euphorbia* sp., *Turgenia latifolia, Centaurea solstitialis, Echium* sp., *Sonchus* sp.	2, 7
345. *P. tritubulata* (Kiritshenko)	*Euphorbia* sp., *E. sequieriana*	2
Pellizzaricoccus		
346. *P. gabrielis* Kozár	*Eriobotrya japonica*	5

Phenacoccus		
347. *P. aceris* (Signoret)	*Acer* sp., *A. campestre, A. negundo, A. platanoides, A. pseudoplatanus, Betula* sp., *Eunoymus japonicus, Aesculus hippocastaneum, Juglans regia, Robinia pseudoacacia, Ficus carica, Fraxinus americana, F. excelsior, Platanus orientalis, Cotoneaster* sp., *Crataegus* sp., *Cydonia oblonga, Malus communis, Mespilus germanica, Prunus* sp., *P. domestica, P. persica, P. spinosa, Pyrus communis, Tilia* sp.	1, 7
348. *P. angustatus* Borchsenius	*Poa* sp.	2
349. *P. avenae* Borchsenius	*Agrostis fenius, Avena* sp., *A. sterilis, Bifora radians, Bromus inermis, Carduus pycnocephalus, Cynodon dactylon, Centaurae* sp., *Diplotaxis tenuifolia, Echium* sp., *Galium* sp., *Hordeum murinum, Lactuca* sp., *Lamium* sp., *Lolium* sp., *Reseda* sp., *Poa bulbosa, Sisymbrium* sp., *Stachys* sp.	2
350. *P. arambourgi* Balachowsky	*Cedrus libani*	1
351. *P. asphodeli* Goux	*Asphodelus microcarpus*	7
352. *P. bicerarius* Borchsenius	*Lolium* sp.	7
353. *P. chatacicus* Kaydan & Kozár	Unknown	2
354. *P. emansor* Williams & Kozarhevskaya	Asteraceae	2
355. *P. eurotiae* Danzig	*Thymus* sp.	2
356. *P. evelinae* (Tereznikova)	*Cynodon dactylon*	7
357. *P. ferulae* Borchsenius	*Dactylis* sp., *Melilotus* sp., *Hordeum vulgare*	7
358. *P. graminicola* Leonardi	*Cynodon dactylon, Thymus* sp., *Eryngium* sp.	3
359. *P. hordei* (Lindeman)	*Hordeum vulgare, Bromus* sp.	7
360. *P. incertus* (Kiritchenko)	*Aegilops* sp., *Capsella bursa-pastoris, Centaurea* sp., *Lactuca* sp., *Brassicaceae,* Poaceae	2
361. *P. interruptus* Green	*Triticum vulgare, Cardaria draba, Chenopodium album*	7
362. *P. karaberdi* Borchsenius & Ter-Grigorian	*Hordeum murinum*	2
363. *P. kokandicus* Nurmamatov	Poaceae	2
364. *P. loiki* Danzig	*Aegilops* sp., *Hordeum murinum, Secale* sp., Poaceae	2, 7
365. *P. madeirensis* Green	*Lantana camara, Mirabilis jalapa, Pelargonium sp. Portulaca grandifolia*	1, 6
366. *P. phenacoccoides* (Kiritchenko)	Unknown	7
367. *P. persimplex* Borchsenius	*Artemisia* sp., *Matricaria* sp., Apiaceae, Asteraceae	2
368. *P. piceae* Löw	*Picea orientalis*	5
369. *P. pumilus* Kiritshenko	*Achillea* sp., *Ajuga* sp., *Amaranthus retroflexus, A. viridis, Anthemis* sp., *Artemisia* sp., *Atriplex* sp., *Bupleurum* sp., *Caucalis* sp., *Centaurae depressa, C. solstitialis, Chenapodium* sp., *Chenopodium botrys, Cichorium intybus, Cirsium* sp., *C. arvense, Chondrilla* sp., *C. juncea, Convolvulus galaticus, Crepis* sp., *Crupina crupinastrum, Daucus* sp., *Descurainia sophia, Diplotaxis tenuifolia, Echium* sp., *Echinophora tenuifolia, Erodium cicutarium, Eryngium campestre, Erysimum* sp., *Euclidium syriacum, Falcaria* sp., *Galium* sp., *Glaucium* sp., *Glaucum flavum, Hirschfeldia incana, Lactuca* sp., *L. seriole, Linaria* sp., *Lithospermum* sp., *Lotus corniculatus, Malva* sp., *Marribium* sp., *Matthiola longipetala, Matricaria* sp., *Melilotus alba, Myosotis* sp., *Polygonum* sp., *Reseda* sp., *Reseda lutea, Salsola* sp., *Scandix* sp., *Scabiosa* sp., *Sideritis* sp., *Silene* sp., *Sinapis arvensis, Sisymbrium officinale, Sium* sp., *Sonchus* sp., *S. arvensis, Taralis* sp., *Trifolium* sp., *Tripleurospermum* sp., *Tragopogon* sp., *Turgenia* sp., *Valerianella* sp., *Verbascum* sp., *Veronica multifolia, Xanthium strumarium, Zosima absinthifolia*	7
370. *P. querculus* Borchsenius	*Quercus* sp.	2, 5
371. *P.* nr. *schmelevi* Bazarov	*Verbascum* sp., *Apiaceae*	2
372. *P. solani* Ferris	*Portulaca oleraceae, Oleae europae*	1
373. *P. solenopsis* Tinsley	*Amaranthus retroflexus, Chrysanthemum morifolium, Vinca rosea, Calendula officinalis, Hibiscus rosa-sinensis, Hibiscus syriacus, Capsicum annuum, Lycopersicon esculentum, Solanum melongena*	1
374. *P. strigosus* Borchsenius	*Lactuca* sp.	2
375. *P. tergrigorianae* Borchsenius	*Chenapodium* sp., *Scabiosa* sp., *Artemisia* sp., *Xanthium* sp., *Achillea* sp., *Cichorium* sp., *Eryngium* sp., *Medicago rigidula*	2, 7
376. *P. transcaucasicus* Hadzibejli	*Malus communis*	7
377. *P. yerushalmi* Ben-Dov	*Pinus brutia, P. sylvestris*	1

Planococcus		
378. *P. citri* (Risso)	Polyfag on Rutaceae and ornamental plants	1, 3, 6, 7
379. *P. ficus* (Signoret)	Polyfag on ornamental plants, *Ficus* sp., *Vitis* sp., *V. vinifera, Punica granatum*	2, 3, 6, 7
380. *P. vovae* (Nasonov)	*Cupressus* sp., *C. sempervirens, C. goveniana, Juniperis excelsa, J. oxycedrus oxycedrus, Laurus nobilis, Libocetrus decurrens, Taxus baccata, Thuja occidentalis*	2, 1, 6, 7
Pseudococcus		
381. *P. laingi* Bodenheimer	Poaceae	7
382. *P. comstocki* (Nasanov)	*Morus* sp., *Platanus orientalis, Vitis vinifera*	2, 5, 7
383. *P. cryptus* Hempel	*Citrus* spp, Polyfag on ornamental plants	1
384. *P. longispinus* (Targioni Tozzetti)	Polyfag on ornamental plats, *Citrus* spp.	1, 5, 6, 7
385. *P. viburni* (Signoret)	Polyfag on ornamental plants, *Citrus* spp., *N. oleander, P. laurocerasus, Salix* sp., *Quercus* sp., *Sambucus nigra* L., *Eriobotrya japonica, Magnolia grandiflora* L.	1, 6, 7
Rhodania		
386. *R. porifera* Goux	*Festuca* sp., *Stipa* sp., Poaceae	2, 7
387. *R. occulta* Schmutterer	*Poaceae*	2
Spilococcus		
388. *S. mamillariae* (Bouche)	*Euphorbia abyssinica, Mammilaria daschyacantha*	7
Spinococcus		
389. *S. morrisoni* (Kiritshenko)	*Artemisia* sp.	7
390. *S. vashlovanicus* Danzig	*Centaurea* sp.	2
Stipacoccus		
391. *S. torosae* Kaydan	*Cynodon dactylon*	7
Trabutina		
392. *T. crassispinosa* Borchsenius	*Tamarix* sp.	1
393. *T. mannipara* (Hemprich & Ehrenberg)	*Tamarix* sp.	1
Trionymus		
394. *T. aberrans* Goux	*Agropyron* sp., *A. cristatum, A. repens, Bromus tectorum, Cynodon dactylon, Echium* sp., *Echinocloa crus-galli, Festuca* sp., *F. arundinaceae, Hordeum murinum, H. vulgare, Lolium perenne, Triticum* sp., *T. vulgare*	2,7
395. *T. cressae* (Hall)	*Euphorbia* sp.	7
396. *T. multivorus* (Kiritchenko)	*Anchusa* sp., *Bunium* sp., *Cardaria* sp., *Caucalis* sp., *Centaurea solstitialis, C. virgata, Cicer* sp., *Cichorium intybus, Cirsium* sp., *C. arvense, Conyza canadensis, Crepis* sp., *Daucus guttatus, D. littoralis, Diplotaxis tenuifolia, Echinophora tenuifolia, Echium* sp., *Eryngium* sp., *E. compestre, Euphorbia* sp., *Falcaria* sp., *Ferula* sp., *Glaucium* sp., *Lactuca* sp., *Lithospermum* sp., *Malva* sp., *Marrubium* sp., *Medicoga sativa, Nepeta* sp., *Onobrychis* sp., *Onopordum* sp., *Papaver* sp., *Phlomis* sp., *Salvia* sp., *Sedum* sp., *Sideritis* sp., *Sonchus* sp., *Stachys* sp., *Taraxacum* sp., *Tragopogon* sp., *Turgenia* sp., *Verbascum* sp., *Xeranthemum* sp.	1, 2, 7
397. *T. perrisii* (Signoret)	*Aegilops* sp., *Agropyron* sp., *Elymus* sp., *Hordeum murinum, Caucalis* (cf) *ptatycarpos*	2, 7
398. *T. tomlini* (Green)	*Koeleria* sp.	5
399. *T. oncueri* Kaydan &Yerlikaya	*Juncus acutus*	3
Volviccoccus		
400. *Volvicoccus volvifer* (Goux)	*Aegilops* sp., *Stipa* sp.	2, 7
PUTOIDAE		
Puto		
401 *P. israilensis* Ben-Dov	*Quercus coccifera, Q. cercis*	1, 3
402. *P. megriensis* (Borchsenius)	*Cnicus* sp.	2
403. *P. palinuri* Marotta & Tranfaglia	Poaceae	7
404. *P. superbus* (Leonardi)	*Galium* sp., *Quercus* sp., *Digitalis* sp.	1, 7
RHIZOECIDAE		
Ripersiella		
405. *R. kaydani* Konczné Benedicty & Kozár	*Narcissus* sp.	3
406. *R. parva* (Danzig)	Unknown	2
407. *R. periolana* Goux	*Stipa* sp.	2, 7
408. *R. poltavae* (Laing)	*Veronica* sp.	2
Gerococcus		
409. *Geococcus coffeae* Green	*Dieffenbachia* sp.	1

Ethics Committee Approval: Since the article does not contain any studies with human or animal subject, its approval to the ethics committee was not required.

Author Contributions: Concept: M.B.K., S.Ü., B.Y., Design: M.B.K., S.Ü., B.Y., Data analysis: M.B.K., S.Ü., B.Y., Writing: M.B.K., S.Ü., B.Y., C.E., Critical Review: M.B.K., S.Ü., B.Y., C.E.

Conflict of Interest: M. Bora Kaydan is a member of Editorial Board of Trakya University Journal of Natural Sciences. However, he was't involved in the decision process during manucript evaluation

Funding: The authors declared that this study has received no financial support.

References

1. Bodenheimer, F.S. 1941. Seven new species of Coccidae from Anatolia. *Revue de la Faculté des Sciences de l'Université d'Istanbul, (Ser. B),* 6: 65-84.
2. Bodenheimer, F. S. 1949. The Coccidea of Turkey. Diaspididae. A monographic study. Ankara, 264 pp.
3. Bodenheimer, F.S. 1952. The Coccoidea of Turkey. I. *Revue de la Faculté des Sciences de l'Université d'Istanbul,(Ser. B),* 17: 315-351.
4. Bodenheimer, F.S. 1953. Türkiye Coccoidleri III. *Revue dela Faculté des Sciences de l'Université d'Istanbul, (Ser. B),*18(2): 91-167.
5. Çanakçıoğlu, H. 1977. *Türkiye'de Orman Ağaçları ve Ağaççıklarında Zarar Yapan Coccoidea (Hom.) Türleri Üzerinde Araştırmalar (Sistematik-Yayılış-Konukçu-Biyoloji),* İÜ Orman Fakültesi Yayınları: 2322, İstabul, 122pp.
6. Çiftci, Ü. & Bolu, H. 2021. First Records of Coccomorpha (Hemiptera) Species in Diyarbakır, Turkey. *Journal ofEntomological Science,* 56(2): 235-245.
7. Develioğlu, U., Muştu, M., & Kaydan, M. B. 2018. Investigation on scale insects (Hemiptera: Coccomorpha) on ornamental plants in Kayseri province. *Türkiye Entomoloji bülteni,* 8: 3-13.
8. Düzgüneş, Z. 1952. *Aonidiella* cinsi ve Türkiye'de bulunannevileri. *Bitki Koruma Bülteni*, 4: 7-10.
9. Düzgüneş, Z. 1957. Karaağaç Koşnilt *Gossyparta spuria* (Dodeer). *A.Ü. Ziraat Fakültesi Yıllığı,* 4: 316-324.
10. Düzgüneş, Z. 1969. Posttlori in Turkey of the San Jose Scale (*Quadraspidiotus perniciosus* Comst.). *OEPP/EPPOPublic. Ser. A.,* 48: 27-29.
11. Düzgüneş, Z. 1970. *Natural enemies of scale insects and their biological control in Turkey.* VIIth International Congress of Plant Protection, Paris, 490-494.
12. Düzgüneş, Z. 1982. *Studies on Pseudococcidae (Homoptera: Coccoidea) species of Turkey.* Ankara Üniversitesi Ziraat Fakültesi Yayınları No: 836, Ankara.
13. Elekçioğlu, N.Z. & Kaydan, M.B. 2021. Scale insect (Hemiptera: Sternorryncha: Coccomorpha) species on medicinal and aromatic plants in Adana (Turkey). *Plant Protection Bulletin*, 61(4): 5-12.
14. Erözmen, K. & Yaşar, B. 2018. Determination of Diaspididae species Hemiptera: Coccomorpha) on Fruit trees in Balıkesir. *Süleyman Demirel University Journal ofNatural and Applied Sciences*, 22(1): 172-181.
15. Erler F., Kozár, F. & Tunç İ. 1996. A preliminary study on armored scale insect (Homoptera, Coccoidea: Diaspididae) fauna of Antalya. *Acta Phytopathologica et Entomogica Hungarica*, 31(1-2): 53-59.
16. Fahringer, J. 1912. Eine Rhynchotenausbeute aus der Türkei, Kleinasien und den benachbarten gebieten. *Konowia*, Bd.I. 305-307.
17. García Morales, M., Denno, B.D., Miller, D.R., Miller, G.L., Ben-Dov, Y. & Hardy N.B. 2016. ScaleNet: A literature-based model of scale insect biology and systematics. Database. doi: 10.1093/database/bav118
18. Kahraman, T., Kırışık, M., & Kahraman, M. U. 2020. Determination of pests and beneficial species in avocado orchards in Antalya Province. *Horticultural Studies*, 37(2): 150-154.
19. Kaydan, M.B., Kozar, F., Yaşar, B. & Erkılıç, L. 2001a. Initial studies on Pseudococcidae fauna in Van province of Turkey. *Acta Phytopathologica et Entomologica Hungarica*, 36(3-4): 377-382.
20. Kaydan, M.B., Ülgentürk, S., Kozar, F. & Toros, S. 2001b.Scale insects (Homoptera: Coccoidea) of natural and agriculture areas in Kapadokya, Turkey. Paper presented at the IX. International Symposium on Scale Insects Studies2-8 September, Padua, Italy.
21. Kaydan, M.B., Kozar, F. & Yaşar, B. 2002. Tree new *Rhizopulvinaria* species (Homoptera: Coccoidea; Coccidae) for scale insect fauna of Turkey, *Turkish Journalof Zoology*, 26(3): 301-304.
22. Kaydan, M.B. Ülgentürk, S., Zeki, C. & Toros, S. 2004. Studies on Pseudococcidae (Homoptera: Coccoidea) faunaof Afyon, Ankara, Burdur and Isparta Provinces, Turkey. *Turkish Journal of Zoology*, 28: 219-224.
23. Kaydan, M.B., Kılınçer, N. & Kozar F. 2005a. Studies on Pseudococcidae (Homoptera: Coccoidea) fauna urban ecosystem of Ankara Province, *Turkey Bolletino di Zoologia Agraria e di Bachicoltura Ser. II*, 37(2): 85-95.
24. Kaydan, M.B., Kılınçer, N. & Kozar F. 2005b. New records of scale Insects (Hemiptera: Coccoidea) from Turkey. *Acta Phytopathologica et Entomologica Hungarica*, 40(3-4): 197-202.
25. Kaydan, M.B., Erkılıç, L. & Kozár, F. 2008. First record of *Phenacoccus solani* Ferris from Turkey (Hem., Coccoidea, Pseudococcidae). *Bulletin de la Société entomologique de France,* 113 (3): 364.
26. Kaydan, M.B. & Kozár, F. 2008. Two new genera and species of Eriococcidae (Hemiptera: Sternorrhyncha:

Coccoidea) with new data on the family in Turkey. *Zootaxa*, 1848: 16-26.

27. Kaydan, M.B. & Gavrilov, I.A. 2010. *Mirococcopsis multicircularia* sp. nov. from Turkey (Sternorrhyncha: Pseudococcidae). *Zoosystematica Rossica*, 19(1): 50-53.
28. Kaydan, M.B. & Kozár, F. 2010a. A review of the genus *Neoacanthococcu*s Borchsenius (Hemiptera: Coccoidea: Eriococcidae) with a description of *Neoacanthococcus atlihani* sp. nov. in Turkey. *Turkish Journal of Entomology*, 34(2): 165-177.
29. Kaydan, M.B. & Kozár, F. 2010b. Soft Scale Insect (Hemiptera: Coccoidea) Species of Eastern Anatolia of Turkey. *Acta Phytopathologica et Entomologica Hungarica*, 45(1):195-221.
30. Kaydan, M.B. & Kozár, F. 2011a. New and rare mealybugs (Hemiptera: Coccoidea: Pseudococcidae, Putoidae) from Eastern Anatolia of Turkey. *Zoosystematica Rossica*, 20(1): 28-39.
31. Kaydan, M.B. & Kozar, F. 2011b. A new species of *Stipacoccus* Tang, 1992 and redescription of *Pararhodania armena*Ter-Grigorian, 1964 (Hemiptera: Coccoidea: Pseudococcidae). *Turkish Journal of Entomology*, 35(4): 587-596.
32. Kaydan, M.B. & Pellizzari, G. 2015. Two new species of *Coccidohystrix* Lindinger (Hemiptera: Coccomorpha: Pseudococcidae) with notes on the related genus *Artemicoccus* Balachowsky. *Turkish Journal of Entomology*, 39: 355-366.
33. Kaydan, M.B. 2011. Revision of *Heterococcopsis* Borchsenius (Hemiptera: Coccoidea: Pseudococcidae), with description of a new genus with two new species fromTurkey. *Zootaxa*, 2970: 49-62.
34. Kaydan, M. 2014a. Türkiye'de yeni ve az bilinen Margarodidae (Hemiptera: Coccoidea) türleri. *Türkiye Entomoloji Bülteni,* 4: 41-46.
35. Kaydan, M. B. 2014b. Türkiye'den *Fonscolombia* Lichtenstein (Hemiptera: Coccoidea: Pseudococcidae) cinsine ait yeni bir türün tanıtımı. *Turkish Journal of Entomology*, 38: 443-449.
36. Kaydan, B. 2015. A systematic study of *Peliococcus* Borchsenius (Hemiptera: Coccoidea: Pseudococcidae), with descriptions of a new Palaearctic genus and four new species from Turkey. *Zootaxa*, 3920: 201-248.
37. Kaydan, M.B., Ülgentürk, S. & Erkılıç, L. 2013a. Checklist of Turkish Coccoidea (Hemiptera: Sternorrhyncha) species. *Bulletin of Turkis Entomology*, 3(4): 157-182.
38. Kaydan, M.B., Çalışkan, A.S. & Ulusoy, M.R. 2013b. New record of invasive mealybug *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) in Turkey. *BulletinOEPP/EPPO*, 43(1): 169-171.
39. Kaydan, M.B., Bolu, H., Spodek, M., Ben-Dov, Y. & Tuğrul, A.F. 2014a. The first record of *Kermes hermonensis* Spodek & Ben-Dov (Hemiptera: Sternorrhyncha: Coccoidea: Kermesidae) in Turkey. *Journal of Entomological Research Society*, 16(3): 95-99.
40. Kaydan, M.B., Ülgentürk, S., Özdemir, I. & Ulusoy, M.R. 2014b. Coccoidea (Hemiptera) species in Bartın and Kastamonu Provinces. *Bulletin of Turkish Entomology*, 54(1): 11-44.
41. Kaydan, M. B., Kozár, F., & Erkılıç, L. 2014c. New and little known scale insect species (Hemiptera: Coccoidea) in Turkey. *Acta Phytopathologica et Entomologica Hungarica*, 60: 227-238.
42. Kaydan, M. B., Pellizzari, G. & Szita, E. 2015a. Two new species of *Coccidohystrix* Lindinger (Hemiptera: Coccomorpha: Pseudococcidae) with notes on the related genus *Artemicoccus* Balachowsky. *Turkish Journal of Entomology* 39: 355-366.
43. Kaydan, M. B., Benedicty, Z. K., & Szita, E. 2015b. The genus *Orthezia* Bosc (Hemiptera: Ortheziidae) in Turkey, with 2 new records. *Turkish Journal of Zoology*, 39: 160-167.
44. Kaymak, A. & Yaşar, B. 2017. Manisa ili park ve süs bitkilerinde bulunan Diaspididae (Hemiptera: Coccomorpha) türlerinin saptanması. *Türkiye Entomoloji Bülteni*, 7(1): 41-53.
45. Keçe-Çalışkan, A.F., Kaydan, B., Ülgentürk, S. & Ulusoy, M. 2015. Description of a new species of *Luzulaspis* Cockerell (Hemiptera: Coccomorpha: Coccidae) from Turkey. Turkish Journal of Entomology, 39(3): 287-296.
46. Keçe-Çalışkan, A.F. & Ulusoy, M.R. 2017. Armored scale insects (Hemiptera: Sternorrhyncha: Diaspididae) on ornamental plants in Adana, Turkey. *Journal of Turkish Entomology*, 41(3): 333-346.
47. Kozár, F., Kaydan, M.B., Benedicty Z.K. & Szita, É. 2013. *Acanthococcidae and Related Families of the Palaearctic Region*. Plant Protection Institute, Centre of Agricultural Research, Hungarian Academy of Science, Budapest, Hungary, 679 pp.
48. Lindinger, L. 1912. *Die Schildläuse (Coccidae) Europas, Nordafrikas und Vorder-Asiens, einschliesslich der Azoren, der Kanaren und Madeiras*. Ulmer, Stuttgart, 388 pp.
49. Mohammed, A.M.E., Ülgentürk, S., Uygun, N., Garonna, A.P., Szenkiraly, F., Fent, M. & Hayat, M. 2016. The distribution, host plants and natural enemies of White peach scale, *Pseudaulacaspis pentagona* (Targioni-Tozzetti) in Ankara Province. *Munis Entomology & Zoology*. 11(2): 650-656.
50. Öncüer, C. 1991. *Türkiye Bitki Zararlısı Böceklerin Parazit ve Predatör Kataloğu*. Ege Üniversitesi Ziraat Fakültesi Yayınları No: 505, İzmir, 281 pp.
51. Öncüer, C., Uygun, N., Erkılıç, L.B. & Karsavuran, Y. 2001). An annotated list of scale insects (Homoptera: Coccoidea) from Turkey. *Acta phytopathologica et entomologica hungarica*, 36(3/4): 389-404.
52. Önder, F., Kısmalı, Ş. &, Turanlı, F. 2000. Manisa, Uşak ve Kütahya illerinde ökseotu (*Viscum album* L.) üzerinde saptanan böcekler, 501-509. Paper presented at the Türkiye 4. Entomoloji Kongresi, 12-15 September, Aydın-Tukey.
53. Özek, S. & Hovasse, R. 1928. *Les enemies des pins aux iles des princes.* Demy 8 Şirketi Mürettibiye matbaası, İstanbul,32 pp.

54. Özkazanç, O. & Yücel, M. 1985. *Reserach on harmful insects of semi-arid region plantations.* Journal of ForestryResearch Institute, Technical Bulletin Series No: 153, Ankara.

55. Özkök, A. 1941. A description of a new coccid *Kermes safinazae* n. sp. (Rhynchota, Coccoidea, Kermesinae). *Ziraat Dergisi*, 2: 18-22.

56. Selmi, E. 1979. Researches pest Coccoidea (Homoptera) species of conifer trees in Marmara Region (systematic distribution-host-biology-natural enemies). *İ.Ü. Orman Fakültesi Dergisi, Seri A.*, 29: 92-127.

57. Schmitchek, E. 1953. *Forstinsekten der Türkei und ihre Umwelt*, Hüsnütabiat Matbaası, İstanbul.

58. Ülgentürk, S. & Toros, S. 1996. Ankara ili park bitkilerindezararlı Diaspididae (Homoptera: Coccoidea) türleri ve konukçuları. 541-548. Paper presented at the 3. EntomolojiKongresi, 24-28 Eylül, Ankara-Turkey.

59. Ülgentürk, S. & Toros, S. 1999. Faunistic studies on Coccidae from ornamental plants in Ankara, Turkey. *Entomologica*, 33: 213-217.

60. Ülgentürk, S., Kaydan, M.B., Zeki, C. & Toros, S. 2001. *Rhodococcus perornatus* (Cockerell and Parrott) (Homoptera: Coccidae): Yağ güllerinin yeni bir zararlısı. *Türk Entomoloji Dergisi*, 25(2): 127-132.

61. Ülgentürk, S. 2002. Türkiye Coccidae Faunası İçin Yeni Bir Kayıt, *Pulvinariella mesembranthemi* (Vallot) (Homoptera: Coccoidea). *Journal of Agricultural Sciences*, 8(4): 285-288.

62. Ülgentürk, S., Kaydan, M.B., Toros, S. & Gürkan, M.O. 2003. A survey of the Eriococcidae (Hemiptera: Coccoidea) of Ankara Province, Turkey. *Phytoparasitica*, 31(5): 442-445.

63. Ülgentürk, S., Şahin, Ö. & Kaydan, M. 2008. Coccoidea (Hemiptera) species on park plants in urban areas of Istanbul province. *Plant Protection Bulletin*, 48(1): 1-18.

64. Ülgentürk, S., Ayhan, B. & Karakaya, A. 2009. Scale insects (Hemiptera: Coccoidea) occurring in the kiwifruit areas of Rize Province, Turkey. *Ziraat Fakültesi Dergisi*, 23(1): 55-60.

65. Ülgentürk, S. & Ayhan, B. 2011. new pest record in agriculture of Turkey: *Neopulvinaria innumerabilis* (Rathvon, 1854) (Hemiptera: Coccidae). *Türkiye Entomoloji Bülteni*, 1(3): 189-196.

66. Ülgentürk, S. & Kozar, F. 2011. A new scale insect genus, *Torosaspis* (Hemiptera: Sternorrhyncha: Coccoidea: Diaspididae), with a new species, *Torosaspis turcica*, fromTurkey. *Zootaxa*, 2907: 63-68.

67. Ülgentürk, S., Şahin Ö., Ayhan B., Sarıbaşak H. & Kaydan, M.B. 2012a. Coccoidea (Hemiptera) species of Tauruscedar (*Cedrus libani*) in Turkey. *Turkish Journal of Entomology*, 36(1): 113-122.

68. Ülgentürk, S., Evren, N., Ayhan, A., Dostbil, Ö., Dursun, O. & Civelek, H.S. 2012b. Scale insect (Hemiptera: Coccoidea) species on pine trees of Turkey. *Turkish Journal of Zoology*, 36: 623-636.

69. Ülgentürk, S., Özdemir, I., Kozar, F., Kaydan, M.B., Dostbil, Ö., Sarıbaşak, H. & Civelek, H.S. 2013. Honeydew producing insect species in forest areas in Western Turkey. *Turkish Bulletin of Entomology*, 3: 125-133.

70. Ülgentürk, S. & Ayhan, B. 2014. Scale insects (Hemiptera:Coccoidea) in the fruit markets in Ankara, Turkey. *Acta Zoologica Bulgarica*, 6: 73-75.

71. Ülgentürk, S., Porcelli, F. & Pellizzari, G. 2014. The scale insects (Hemiptera: Coccoidea) on bamboos in the Western-Palearctic Region: new records and distributionaldata. *Acta Zoologica Bulgarica*, 6, 77-82.

72. Ülgentürk, S. 2015. Cycas palmiyelerinin kaçak yolcusu; *Aulacaspis yasumatsui* Takagi (Hemiptera: Diaspididae). *Türkiye Entomoloji Bülteni*, 5(4): 195-200.

73. Ülgentürk, S. 2016a. Biology, natural enemies and distribution of *Physokermes hellenicus* Kozár & Gounari (Hemiptera: Coccidae) in Turkey. *Entomologica*, 47: 71-75.

74. Ülgentürk, S. 2016b. A new introduced wax scale to Turkey: *Ceroplastes ceriferus* (Fabricius) (Hemiptera: Coccidae). *Munis Entomology & Zoology*, 11(2): 359-362.

75. Ülgentürk, S., Fent, M. & Civelek, S.H. 2016. Biological observations of *Matsucoccus josephi* (Hemiptera: Matsucoccidae) in Turkey. *Entomologica*, 47: 67-70.

76. Ülgentürk, S. & Mohammed, A.M.E. 2016. Scale insects (Hemiptera: Coccoidea) on mulberry trees in Turkey. *Redia*, 99(1): 225-228.

77. Ülgentürk, S. & Özdemir, M. 2018. Scale insects (Hemiptera: Coccomorpha: Coccoidea) on oriental spruce in Turkey. *Turkish Journal of Forest*, 20(2): 76-79.

78. Ülgentürk, S., Özdemir, I., Muştu, M., Dostbil, Ö. & Erbaş, C. 2019a. Pest species of Aphidomorpha and Coccomorpha (Hemiptera) on conifers urban areas of Ankara, Turkey. *Munis Entomology & Zoology*, 14: 51-61.

79. Ülgentürk, S., Cosic, B., Özdemir, I., İpek, A. & Sorkun K.2019b. Insects as the source of honeydew honey in some cedar, fir, oak, spruce forests of Turkey. *Baltic Forestry*, 26(1): 397.

80. Yaşar, B. 1990. *Coccidae ve Diaspididae (Hom.; Coccoidea) species on ornamental plants in İzmir.* PhD Dissertation, Ege University, İzmir, Turkey.

81. Yaşar, B. 1991. A new *Asterodiaspis* Signoret species (Homoptera, Asterolecaniidae) for Turkish fauna. *Türkiye Entomoloji Dergisi*, 15(1): 61-64.

82. Yaşar, B. 1995. Türkiye *Diaspididae (Homoptera: Coccoidea) Faunası Üzerinde Taksonomik Araştırmalar*. Yüzüncü Yıl Üniversitesi Matbaası, Van, 289 pp.

83. Yaşar, B., Özgökçe M. S. & Kasap I. 1995. Studies on the armoured scale insects (Homoptera: Cocciodea) fauna of Van province. *Journal of University of Yüzüncü yıl*, 5: 15.

84. Yerlikaya, H., Başpınar, H., & Kaydan, M. B. 2021. A new species of *Trionymus* (Berg, 1899) (Hemiptera: Pseudococcidae) genus in Turkey. *Turkish Journal of Entomology*, 45: 323-330.

Yazım Kuralları

Trakya University Journal of Natural Sciences

(Trakya Univ J Nat Sci)

Trakya University Journal of Natural Sciences, her yıl Nisan ve Ekim aylarında olmak üzere yılda iki sayı olarak çıkar ve **Biyoloji, Biyoteknoloji, Çevre Bilimleri, Biyokimya, Biyofizik, Su Ürünleri, Ziraat, Veterinerlik, Ormancılık, Hayvancılık, Genetik, Gıda, Temel Tıp Bilimleri** alanlarındaki teorik ve deneysel yazıları yayınlar. Dergide yazılar İngilizce olarak yayınlanır. Ancak, yazıda Türkçe özet olmalıdır. Yabancı yazarlar için Türkçe özet desteği verilecektir. Özet kısmında kısaca giriş, materyal ve metot, sonuçlar ve tartışma başlıkları yer almalıdır. Dergide orijinal çalışma, araştırma notu, derleme, teknik not, editöre mektup, kitap tanıtımı yayınlanabilir. Değerlendirilmek üzere dergiye gönderilen yazıların yazımında ulusal ve uluslararası geçerli etik kurallara Committee on Publication Ethics (COPE) uyularak araştırma ve yayın etiğine dikkat edilmesi gerekmektedir. Yazılara konu olarak seçilen deney hayvanları için etik kurul onayı alınmış olmalı ve yazının sunumu esnasında dergi sistemine ek dosya olarak eklenerek belgelendirilmelidir. Basılacak yazıların daha önce hiçbir yerde yayınlanmamış ve yayın haklarının verilmemiş olması gerekir. Dergide yayınlanacak yazıların her türlü sorumluluğu yazar(lar)ına aittir.

Yazıların sunulması

Yazılar http://dergipark.gov.tr/trkjnat web adresi üzerinden gönderilmelidir. Dergiye yazı gönderimi mutlaka online olarak yapılmalıdır.

Yazı gönderiminde daha önce Dergi Park sistemine giriş yapmış olan kullanıcılar, üye girişinden kullanıcı adı ve şifreleri ile giriş yapabilirler.

Yazı gönderiminde sisteme ilk kez giriş yapacak ve yazı gönderecek yazarlar **"GİRİŞ"** bölümünden "**KAYDOL**" butonunu kullanacaklardır.

Yazarlar dergipark sistemine kaydolduktan sonra **"YAZAR"** bölümünden girecek ve yazıyı sisteme, yönergelere uygun olarak yükleyeceklerdir.

Yazı hazırlama ilkeleri

Yazılar, Yayın Komisyonu'na **MS Word** kelime işlemcisiyle **12 punto** büyüklüğündeki **Times New Roman** tipi yazı karakteriyle ve 1,5 aralıklı yazılmış olarak gönderilmelidir. İletişim bilgileri yazının ilk sayfasında tek başına yazılmalı, daha sonraki sayfada yazar isimleri ve iletişim bilgileri bulunmamalıdır. Tüm yazı her sayfası kendi arasında **satır numaraları** içerecek şekilde numaralandırılmalıdır. Yazar adları yazılırken herhangi bir akademik unvan belirtilmemelidir. Çalışma herhangi bir kurumun desteği ile yapılmış ise, teşekkür kısmında kurumun; kişilerin desteğini almış ise kişilerin bu çalışmayı desteklediği yazılmalıdır.

Yazı aşağıdaki sıraya göre düzenlenmelidir:

Yazarlar: Yazının ilk sayfasında sadece yazar isimleri ve adresleri bulunmalıdır. Adlar kısaltmasız, soyadlar büyük harfle ve ortalanarak yazılmalıdır. Adres(ler) tam yazılmalı, kısaltma kullanılmamalıdır. Birden fazla yazarlı çalışmalarda, yazışmaların hangi yazarla yapılacağı yazar ismi altı çizilerek belirtilmeli (sorumlu yazar) ve **yazışma yapılacak yazarın adres ve e-posta adresi yazar isimlerinin hemen altına yazılmalıdır. Bu sayfaya yazı ile ilgili başka bir bilgi yazılmamalıdır. Yazı, takip eden sayfada bulunmalı ve yazar-iletişim bilgisi içermemelidir.**

Başlık: İngilizce olarak Kısa ve açıklayıcı olmalı, büyük harfle ve ortalanarak yazılmalıdır.

Özet ve Anahtar kelimeler: Türkçe ve İngilizce özet 250 kelimeyi geçmemelidir. Özetin altına küçük harflerle anahtar kelimeler ibaresi yazılmalı ve yanına anahtar kelimeler virgül konularak sıralanmalıdır. Anahtar kelimeler, zorunlu olmadıkça başlıktakilerin tekrarı olmamalıdır. İngilizce özet koyu harflerle "Abstract" sözcüğü ile başlamalı ve başlık, İngilizce özetin üstüne büyük harflerle ortalanarak yazılmalıdır. Yazıdaki ana başlıklar ve varsa alt başlıklara **numara verilmemelidir.**

Giriş: Çalışmanın amacı ve geçmişte yapılan çalışmalar bu kısımda belirtilmelidir. Yazıda SI (Systeme International) birimleri ve kısaltmaları kullanılmalıdır. Diğer kısaltmalar kullanıldığında, metinde ilk geçtiği yerde 1 kez açıklanmalıdır. Kısaltma yapılmış birimlerin sonuna nokta konmamalıdır (45 m mesafe tespit edilmiştir). Kısaltma cümle sonunda ise nokta konmalıdır (… tespit edilen mesafe 45 m. Dolayısıyla…).

Materyal ve Metod: Eğer çalışma deneysel ise kullanılan deneysel yöntemler detaylı ve açıklayıcı bir biçimde verilmelidir. Yazıda kullanılan metod/metodlar, başkaları tarafından tekrarlanabilecek şekilde açıklayıcı olmalıdır. Fakat kullanılan deneysel yöntem herkes tarafından bilinen bir yöntem ise ayrıntılı açıklamaya gerek olmayıp sadece yöntemin adı verilmeli veya yöntemin ilk kullanıldığı çalışmaya atıf yapılmalıdır.

Sonuçlar: Bu bölümde elde edilen sonuçlar verilmeli, yorum yapılmamalıdır**.** Sonuçlar gerekirse tablo, şekil ve grafiklerle de desteklenerek açıklanabilir.

Tartışma: Sonuçlar mutlaka tartışılmalı fakat gereksiz tekrarlardan kaçınılmalıdır. Bu kısımda, literatür bilgileri vermekten çok, çalışmanın sonuçlarına yoğunlaşmalı, sonuçların daha önce yapılmış araştırmalarla benzerlik ve farklılıkları verilmeli, bunların muhtemel nedenleri tartışılmalıdır. Bu bölümde, elde edilen sonuçların bilime katkısı ve önemine de mümkün olduğu kadar yer verilmelidir.

Teşekkür: Mümkün olduğunca kısa olmalıdır. Teşekkür, genellikle çalışmaya maddi destek sağlayan kurumlara, kişilere veya yazı yayına gönderilmeden önce inceleyip önerilerde bulunan uzmanlara yapılır. Teşekkür bölümü kaynaklardan önce ve ayrı bir başlık altında yapılır.

Kaynaklar: Yayınlanmamış bilgiler kaynak olarak verilmemelidir (*Yayınlanmamış kaynaklara örnekler: Hazırlanmakta olan veya yayına gönderilen yazılar, yayınlanmamış bilgiler veya gözlemler, kişilerle görüşülerek elde edilen bilgiler, raporlar, ders notları, seminerler gibi*). Ancak, tamamlanmış ve jüriden geçmiş tezler ve DOI numarası olan yazılar kaynak olarak verilebilir. Kaynaklar, yazı sonunda alfabetik sırada (yazarların soyadlarına göre) sıra numarası ile belirtilerek verilmelidir.

Kaynak yazım şekli:

Kaynak yazım şekli için Endnote stilini http://www.researchsoftware.com adresinden indirebilirsiniz.

Veya aşağıdaki yönergeyi kullanabilirsiniz.

Yazıların ve kitapların referans olarak veriliş şekilleri aşağıdaki gibidir:

Makale: Yazarın soyadı, adının baş harfi, basıldığı yıl. Makalenin başlığı, *derginin adı*, cilt numarası, sayı, sayfa numarası. Dergi adı italik yazılır.

Örnek:

Tek yazarlı Makale için

Soyadı, A. Yıl. Makalenin adı. (Sözcüklerin ilk harfi küçük). *Yayınlandığı derginin açık ve tam adı*, Cilt(Sayı)**:** Sayfa aralığı.

Kıvan, M. 1998. *Eurygaster integriceps* Put. (Heteroptera: Scuteleridae)'nin yumurta parazitoiti *Trissolcus semistriatus* Nees (Hymenoptera: Scelionidae)'un biyolojisi üzerinde araştırmalar. *Türkiye Entomoloji Dergisi*, 22(4): 243-257.

İki ya da daha çok yazarlı makale için

Soyadı1, A1. & Soyadı2**,** A2. Yıl. Makalenin adı**.** (Sözcüklerin ilk harfi küçük). *Yayınlandığı derginin tam adı*, Cilt(Sayı): Sayfa aralığı.

Lodos, N. & Önder, F. 1979. Controbution to the study on the Turkish Pentatomoidea (Heteroptera) IV. Family: Acanthasomatidae Stal 1864. *Türkiye Bitki Koruma Dergisi*, 3(3): 139-160.

Soyadı1, A1., Soyadı2, A2. & Soyadı3, A3**.** Yıl. Makalenin adı**.** (Sözcüklerin ilk harfi küçük). *Yayınlandığı derginin tam adı*, Cilt (Sayı): Sayfa aralığı.

Önder, F., Ünal, A. & Ünal, E. 1981. Heteroptera fauna collected by light traps in some districts of Northwestern part of Anatolia. *Türkiye Bitki Koruma Dergisi***,** 5(3): 151-169.

Kitap: Yazarın soyadı, adının baş harfi, basıldığı yıl. Kitabın adı (varsa derleyen veya çeviren ya da editör), cilt numarası, baskı numarası, basımevi, basıldığı şehir,toplam sayfa sayısı.

Örnek:

Soyadı, A., Yıl. *Kitabın adı*. (Sözcüklerin ilk harfi büyük, italik). Basımevi, basıldığı şehir, toplam sayfa sayısı s./pp.

Önder F., Karsavuran, Y., Tezcan, S. & Fent, M. 2006. *Türkiye Heteroptera (Insecta) Kataloğu*. Meta Basım Matbaacılık, İzmir, 164 s.

Lodos, N., Önder, F., Pehlivan, E., Atalay, R., Erkin, E., Karsavuran, Y., Tezcan, S. & Aksoy, S. 1999. Faunistic *Studies on Lygaeidae (Heteroptera) of Western Black Sea, Central Anatolia and Mediterranean Regions of Turkey.* Ege University, İzmir, ix + 58 pp.

Kitapta Bölüm: Yazarın soyadı, adının baş harfi basıldığı yıl. Bölüm adı, sayfa numaraları. Parantez içinde: Kitabın editörü/editörleri, *kitabın adı*, yayınlayan şirket veya kurum, yayınlandığı yer, toplam sayfa sayısı.

Örnek:

Soyadı, A., Yıl. Bölüm adı, sayfa aralığı. In: (editör/editörler). *Kitabın adı*. (Sözcüklerin ilk harfi büyük, italik). Basımevi, basıldığı şehir, toplam sayfa sayısı s./pp.

Jansson, A. 1995. Family Corixidae Leach, 1815—The water boatmen. Pp. 26–56. In: Aukema, B. & Rieger, C.H. (eds). *Catalogue of the Heteroptera of the Palaearctic Region.* Vol. 1. Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorpha and Leptopodomorpha. The Netherlands Entomological Society, Amsterdam, xxvi + 222 pp.

Kongre, Sempozyum: Yazarlar, Yıl. "Bildirinin adı (Sözcüklerin ilk harfi küçük), sayfa aralığı". Kongre/Sempozyum Adı, Tarihi (gün aralığı ve ay), Yayınlayan Kurum, Yayınlanma Yeri.

Örnek:

Bracko, G., Kiran, K., & Karaman, C. 2015. The ant fauna of Greek Thrace, 33-34. Paper presented at the 6th Central European Workshop of Myrmecology, 24-27 July, Debrecen-Hungary.

Internet: Eğer bir bilgi herhangi bir internet sayfasından alınmış ise (*internetten alınan ve dergilerde yayınlanan yazılar hariç*), kaynaklar bölümüne internet sitesinin ismi tam olarak yazılmalı, siteye erişim tarihi verilmelidir.

Soyadı**,** A. Yıl. Çalışmanın adı. (Sözcüklerin ilk harfi küçük) http://www..... (Date accessed: 12.08.2009).

Hatch, S., 2001. Studentsperception of online education. Multimedia CBT Systems. http://www.scu.edu.au/schools/sawd/moconf/papers2001/hatch.pdf (Date accessed: 12.08.2009).

Kaynaklara metin içinde numara verilmemeli ve aşağıdaki örneklerde olduğu gibi belirtilmelidir.

Örnekler:
... x maddesi atmosferde kirliliğe neden olmaktadır (Landen 2002). Landen (2002) x maddesinin atmosferde kirliliğe neden olduğunu belirtmiştir. İki yazarlı bir çalışma kaynak olarak verilecekse, (Landen & Bruce 2002) veya Landen & Bruce (2002)'ye göre. ... şeklinde olmuştur; diye verilmelidir. Üç veya daha fazla yazar söz konusu ise, (Landen *et al.* 2002) veya Landen *et al.* (2002)'ye göre .... olduğu gösterilmiştir; diye yazılmalıdır.

Şekil ve Tablolar: Tablo dışında kalan fotoğraf, resim, çizim ve grafik gibi göstermeler "Fig." olarak verilmelidir. Resim, şekil ve grafikler, net ve ofset baskı tekniğine uygun olmalıdır. Her tablo ve şeklin metin içindeki yerlerine konmalıdır. Tüm tablo ve şekiller yazı boyunca sırayla numaralandırılmalı (Table 1, Fig. 1, Figs 3, 4), başlık ve açıklamalar içermelidir. Şekillerin sıra numaraları ve başlıkları, alta, tabloların ki ise üstlerine yazılır.

Şekiller (tablo dışında kalan fotoğraf, resim, çizim ve grafik gibi) tek tek dosyalar halinde en az **300 dpi** çözünürlükte ve **tif** dosyası olarak şekil numaraları dosya isminde belirtilmiş şekilde ayrıca sisteme ek dosya olarak yüklenmelidir.

Sunulan yazılar, öncelikle Dergi Yayın Kurulu tarafından ön incelemeye tabii tutulur. **Dergi Yayın Kurulu, yayınlanabilecek nitelikte bulmadığı veya yazım kurallarına uygun hazırlanmayan yazıları hakemlere göndermeden red kararı verme hakkına sahiptir.** Değerlendirmeye alınabilecek olan yazılar, incelenmek üzere iki ayrı hakeme gönderilir. Dergi Yayın Kurulu, hakem raporlarını dikkate alarak yazıların yayınlanmak üzere kabul edilip edilmemesine karar verir.

SUİSTİMAL İNCELEMELERİ VE ŞİKAYETLER

Dergide yayınlanmış veya yayınlanma sürecine girmiş her türlü yazı hakkındaki suistimal şüphesi ve suistimal şüphesiyle yapılan şikayetler dergi Yayın Kurulu tarafından değerlendirilir. Yayın kurulu suistimal şüphesini veya şikayeti değerlendirirken COPE (Committee on Publication Ethics)'un yönergelerine bağlı kalır. Şüphe veya şikayet sürecinde şikayet taraflarıyla hiçbir bağlantısı olmayan bir ombudsman belirlenerek karar verilir. Şikayetler baş editöre tujns@trakya.edu.tr adresi kullanılarak yapılabilir.

TELIF HAKKI

Telif hakkı, makalenin yayınlandığı andan itibaren (Erken Görünüm dahil) herhangi bir kısıtlama olmaksızın makalenin yazarına / yazarlarına devredilir.

YAYIN SONRASI DEĞİŞİKLİK VE GERİÇEKME İSTEĞİ

Dergide yazının yayınlanması sonrası yazar sırasında değişiklik, yazar ismi çıkarma, ekleme ya da yazının geriçekilmesi tujns@trakya.edu.tr adresine yapılacak bir başvuru ile gerçekleştirilebilir. Gönderilecek e-postada mutlaka gerekçe ve kanıtlar sunulmalıdır. Sunulan gerekçe ve kanıtlar Yayın Kurulu tarafından görüşülüp karara bağlanır. Yukarıda belirtilen değişiklik ve geri çekme istekleri oluştuğunda tüm yazarların dergiye gönderecekleri yazılar işlem süresi içerisinde otomatik olarak reddedilir.

ÜYELİK/AYRI BASKI/ERİŞİM

Dergi üyelik gerektirmeyip Açık Erişime sahiptir. Dergide yazısı basılan tüm sorumlu yazarlara 15 ayrı baskı ve yazının çıktığı 1 dergi ücretsiz gönderilmektedir. Dergide yayınlanan tüm yazılara erişim ücretsiz olup full-text pdf dosyaları CC-BY 4.0 uluslararası lisansı kapsamında kullanılabilir.

REKLAM VERME

Dergiye reklam vermek üzere tujns@trakya.edu.tr adresine yapılacak başvurular dergi sahibi tarafından değerlendirilecektir.

Baş Editör **:** Prof. Dr. Kadri KIRAN

Trakya Üniversitesi
Fen Bilimleri Enstitüsü
Balkan Yerleşkesi
22030 - EDİRNE

Tel : 0284 235 82 30
Fax : 0284 235 82 37
e-mail : tujns@trakya.edu.tr

Trakya University Journal of Natural Sciences
(Trakya Univ J Nat Sci)

Trakya University Journal of Natural Sciences, is published twice a year in April and in October and includes theoretical and experimental articles in the fields of **Biology, Biotechnology, Environmental Sciences, Biochemistry, Biophysics, Fisheries Sciences, Agriculture, Veterinary and Animal Sciences, Forestry, Genetics, Food Sciences** and **Basic Medicine Sciences**. Original studies, research notes, reviews, technical notes, letters to the Editor and book reviews can be published in the journal. The publishing language for all articles in the journal is **English**. On the other hand, authors are required to provide a Turkish abstract also. The Turkish version of the abstract will be supply by the journal for foreign authors. Abstracts should include introduction, material and methods, results and discussion sections in summary. The authors should pay attention to research and publication ethics Committee on Publication Ethics (COPE) in preparation of their manuscripts before submission by considering national and international valid ethics. An approval of Ethics and Animal Welfare Committee is mandatory for submissions based on experimental animals and this approval should be provided during submission of the manuscripts. Articles which have not been published elsewhere previously and whose copyright has not been given to anywhere else should be submitted. All responsibilities related to published articles in Trakya University Journal of Natural Sciences belong to the authors.

Submitting articles

Articles should be submitted on the web through http://dergipark.gov.tr/trkjnat and all submissions should be performed online.

Authors, who are already a member of the DergiPark system, can enter in the login section using their "user name" and "password" to submit their articles.

Authors entering the DergiPark system for the first time to submit an article will enter in the "**REGISTER**" section to submit their articles.

Article preparation rules

Articles should be submitted to the Journal using **MS Word** preparing **12 points Times New Roman** font and 1.5 raw spacing. Author names and contact info must be in first page, article must continue in second page without author names and contact info. Whole article should have numbered with **line number** restarting each page. The author's name must not be specified any academic titles. If studies supported by a foundation, this support should have been written in the acknowledgement section.

Articles should be arranged as below:

Authors: The name(s) of the author(s) should not be abbreviated and must be written under the title one by one, with surnames in capital letters. Address(es) should be written in full. Corresponding authors in multiple authored submissions should be indicated, and the address and e-mail of the corresponding author should be written just under the author(s) list. **No other information about the manuscript should be included in this page. The main manuscript text should start with the following new page and should not include any author-contact information.**

Title: Should be short and explanatory and written in capital letters and centered.

Abstract and keywords: Turkish and English abstracts should not exceed 250 words. "Keywords" should be written under the abstract in small letters and all keywords should be written using a comma after all. Keywords should not be replica of the title words, if it is not obligatory. Abstract should begin "Abstract" word from the left side of the page. The main and sub headers (if present) should not be numbered.

Introduction: The aim of the submitted and history of the previous studies should be indicated in this section. SI (Systeme International) system and abbreviation should be used in the article. Other abbreviations- should be explained once in their first appearance in the text. No "." sign should be used after abbreviations except those used at the end of a sentence (…the determined distance is 45 m. Therefore, …).

Material and Method: If the submitted study is experimental, methods of the experiments should be given in detail. The method(s) used in the article should be descriptive for others to repeat. If a widely known

experimental method is used, the method does not need to be explained in detail. In this situation, indicating only the name of the experimental method or citing the study who used the method for the first time will be enough.

Results: Obtained results should be given in this section without any comment. Results can be explained with tables, figures or graphics, if necessary.

Discussion: Results must be discussed, but unnecessary duplications should be avoided. In this section, rather than giving literature data, authors should focus on their results considering similarities and differences with and between previously conducted researches, and should discuss possible reasons of similarities and differences. The contribution to science and importance of the obtained results should also be mentioned as much as possible in this section.

Acknowledgements: Should be as short as possible. Thanks are usually made to institutions or individuals who support the study or to experts who reviewed the article before submitting to the journal. Acknowledgement section should be given before the references section in a separate header.

References: Unpublished information should not be given as a reference (examples of unpublished references: articles in preparation or submitted somewhere, unpublished data or observations, data obtained based on interviews with individuals, reports, lecture notes, seminars, etc.). However, thesis completed and signed by a jury and articles with DOI numbers given can be used as reference. References should be given at the end of the text, sorted alphabetically by author's surname and should be given with numbering.

Reference style:

You can download the Endnote style of TUJNS from http://www.researchsoftware.com.

Or you can follow the instruction below.

Articles: Surname of author, first letter of author's first name, publication year, article title, the *name of the journal*, volume, issue, page numbers. Journal name is written in italics.

Example:

Articles with single author

Surname, N. Year. Article title (First letter of all words small). *Whole name of journal*, Volume (Issue)**:** page range.

Aybeke, M. 2016. The detection of appropriate organic fertilizer and mycorrhizal method enhancing salt stress tolerance in rice (*Oryza sativa* L.) under field conditions. *Trakya University Journal of Natural Sciences*, 17(1): 17-27.

Articles with two or more authors

Surname1, N1. & Surname2**,** N2. Year. Article title (First letter of all words small). *Whole name of journal*, Volume (Issue)**:** page range.

Dursun, A. & Fent, M. 2016. Contributions to The Cicadomorpha and Fulgoromorpha (Hemiptera) fauna of Turkish Thrace region. *Trakya University Journal of Natural Sciences*, 17(2): 123-128.

Surname1, N1., Surname2**,** N2. & Surname3, N. Year. Article title (First letter of words small). *Whole name of journal*, Volume (Issue)**:** page range.

Becenen, N., Uluçam, G. & Altun, Ö. 2017. Synthesis and antimicrobial activity of iron cyclohexanedicarboxylic acid and examination of pH effect on extraction in water and organic phases. *Trakya University Journal of Natural Sciences*, 18(1): 1-7.

Book: Surname of author, first letter of author's first name, Year. *Book title* (name of translator or book editor if present), volume, edition number, press, city, page number.

Example:

Surname, N. Year. *Book Title* (First letter of words small and italic), volume, edition number, press, city, page number.

Czechowski, W., Radchenko, A., Czechowska, W. & Vepsäläinen, K. 2012. *The ants of Poland with reference to the myrmecofauna of Europe*. Museum and Institute of Zoology PAS, Warsaw, 496 pp.

Book Section: Surname of author, first letter of the author's first name, Year. Section name, page range. In: (Editor(s) of Book, *Book title*, press, city, page number).

Example:

Surname, N. Year. Section name, page range. In: (Editor of Book, *Book title* (First letter of words small and italic), press, city, page number)

Jansson, A. 1995. Family Corixidae Leach, 1815—The water boatmen. pp. 26-56. In: Aukema, B. & Rieger, C.H. (eds). *Catalogue of the Heteroptera of the Palaearctic Region.* Vol. 1. Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorphaand Leptopodomorpha. The Netherlands Entomological Society, Amsterdam, xxvi + 222 pp.

Congress, Symposium: Surname, N. Year. Presentation title (first letters of all words small), page range. Name of Congress/Symposium, Date (day range and month), place.

Example:

Bracko, G., Kiran, K., & Karaman, C. 2015. The ant fauna of Greek Thrace, 33-34. Paper presented at the 6th Central European Workshop of Myrmecology, 24-27 July, Debrecen-Hungary.

Internet: If any information is taken from an internet source (articles published in journals and taken from internet excluded), internet address should be written in full in references section and access date should be indicated.

Surname**,** N. Year. Name of study (First letter of words small). http://www..... (Date accessed: 12.08.2009).

Hatch, S. 2001. Student sperception of online education. Multimedia CBT Systems. http://www.scu.edu.au/schools/sawd/moconf/papers2001/hatch.pdf (Date accessed: 12.08.2009).

References within the text should not be numbered and indicated as in the following examples.

Examples:

... atmospheric pollution is causing by x matter (Landen 2002). If an article has two authors, it should be indicated in the text as (Landen & Bruce 2002) or ... according to Landen & Bruce (2002) .... If there are three or more authors, references should be indicated as (Landen *et al.* 2002) or according to Landen *et al.* 2002 ...

Graphics and tables: All photos, pictures, drawings and graphics except tables should be indicated as Figures. Pictures, figures and graphics should be clear and ready to print with offset technique. The places of all tables and figures should be indicated in the text. All tables and figures should be numbered within the text respectively (Table 1, Fig. 1, Figs 3, 4). Figure numbers and legends are written below the figures, table numbers and legends are written above the tables.

All figures (all pictures, drawings and graphics except table) should also be uploaded to the system separately with 300dpi resolution at least as .tif file using the figure numbers in the files name.

Submitted articles are subjected to prior review by the Editorial Board. Editorial Board has the right to reject the articles which are considered of low quality for publish or those which are insufficiently prepared according to the author guidelines. The articles accepted for consideration for evaluation will be sent to two different referees. Editorial Board decides to accept or reject the submissions for publication by taking into account the reports of referees.

COPYRIGHT

LICENSE

EXPLOITATION ENQUIRY AND COMPLAINTS

All kinds of exploitation doubts and complaints about manuscripts, either published or in publication process, are evaluated by the Editorial Board. The Editorial Board strictly follows the directives of COPE (Committee on Publication Ethics) during the evaluations. An ombudsman who has no connection with the parts in any stage of the complaint is appointed and a decision is made. Complaints can be sent to the editor in chief by sending an e-mail to tujns@trakya.edu.tr.

POST-PUBLICATION CHANGE AND WITHDRAWAL OF A MANUSCRIPT

Changes in author ordering, removal or addition of a new author in and withdrawal of a published manuscript can be realized by sending an application to tujns@trakya.edu.tr. The application e-mail should include the reason of the requested change with the evidences. The reasons and the evidences are discussed and finalized by the Editorial Board. Further submissions of authors of a formerly accepted manuscript undergoing a change process are automatically sent back to the authors until the final decision of the manuscript in process.

ADVERTISING

Advertising applications send to tujns@trakya.edu.tr will be evaluated by the journal owner.

Editor-in-Chief **:** Prof. Dr. Kadri KIRAN

Trakya Üniversitesi
Fen Bilimleri Enstitüsü
Balkan Yerleşkesi
22030 - EDİRNE-TURKEY

Phone : +90 284 235 82 30
Fax : +90 284 235 82 37
e-mail : tujns@trakya.edu.tr