Journal of the HETEROPTERA of Turkey

e-ISSN 2687 - 3249

Vol. 3:1

May, 2021

Powered by peer review management
and editorial system
Heteropterists

"*Journal of the Heteroptera of Turkey***"** is a international journal, and publish scholarly heteropteran studies.
ISSN: 2687-3249 (only Online edition)

This journal is published semiannually (May and November) by Heteropterists of Turkey.

Description

"Journal of the Heteroptera of Turkey" publishes original research and review articles all key areas in Heteroptera (Insecta) of paleaearctic region. All work needs to have a clear and significant impact on palaearctic Heteroptera taxons.. Review studies considerations are only accepted in combination with new faunistic or taxonomic data in studies area. The journal focuses on research into systematic, taxonomic, ecologic, faunistic etc heteroptera and articles presenting innovative approaches.
Prospective review authors should read instruction for authors on the web page (**www.j-ht.org**) before submitting a manuscript.

Journal of the Heteroptera of Turkey (*JHT*)
c/o Gazi University, Sciences Faculty, Department of Biology, 06500 Teknikokullar-ANKARA / TURKEY
Phone: (+90) 312 202 11 79 Fax: (+90) 312 212 22 79 E-mail: editor_office@j-ht.org

Powered by peer review management and editorial system Heteropterists.

Publication Frequency: Semiannual [2 issues per year (November and May)]
JHT is indexed/abstracted in: Index Copernicus, CiteFactor-Academic Scientific Journals, Academic Research Index, DRJI, Google Scholar, ResearchGate, EZB-Electronic Journals Library, Worldcat, ASOS Index and ROAD, Biological Abstracts, BIOSIS Previews, Zoological Record.
Archived at: Internet Archive-Wayback machine – https://archive.org ; ZENODO (https://zenodo.org/deposit?page=1&size=20)
Journal web addresse: **www.j-ht.org**

This issue of "*Journal of the Heteroptera of Turkey*" is dedicated to an accomplished Turkish Entomologist / Lepidopterist scientist and excellent advisor **Prof. Dr. Ahmet Ömer KOÇAK (1947-2020**) distinguished.

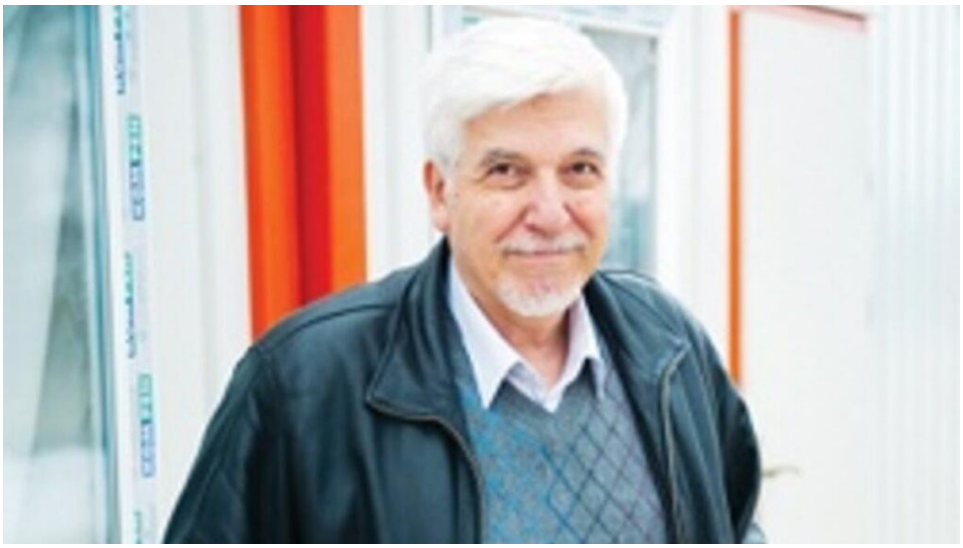
He was former Professor of Biology in the Department of Biology, Faculty of Sciences, Gazi University.

His passed away on Nov 18, 2020.

Prof.Dr.Suat KIYAK
Editor-in-Chief

OBITUARY

Prof.Dr. Ahmet Ömer KOÇAK-Turkish Entomologist/Lepidopterist (1947-2020)



Prof. Dr. Ahmet Ömer KOÇAK – Turkish Entomologist/Lepidopterist (1947-2020) Prof. Dr. Ahmet Ömer KOÇAK was supervisor of my phD and Ms Sci. Former member of Faculty of Sciences Department of Biology-Gazi University/TURKEY passed away on 18.11.2020. **Rest in peace...**

Prof.Dr.Suat KIYAK
Editor-in-Chief

Prof.Dr. Ahmet Ömer KOÇAK was born on 1947 in Bayburt/Turkey. He has led a successful career throughout in life as a entomologist after his graduation from the University of Ankara Faculty od Science. He did his PhD in Zoology/Biology on the subject Lepidoptera at Ankara University. Then, he worked head of department as Assoc Prof Dr and Prof Dr at the Department of Biology in the Gazi University Faculty of Science between 1982 and 2000. He was promoted to professorship and worked as a professor at the Department of Biology of the Gazi University Faculty of Science (1986). Then, he worked as Prof.Dr. at the Department of Biology in the Yüzüncüyıl University Faculty of Science (Van/ Turkey) between 2000 and 2014. He served as head of the biology department (2004-2007) and also served as dean of the Faculty of Science in Yüzüncüyıl University between the periods 2007-2010. Before his demise on November 18, 2020, he worked as Professor emeritus at the Faculty of Sciences Yüzüncüyıl Univ. of Van (2014-2019).

Between 1966 and 2006, he worked in several countries in scientific missions for the entomological expedition. He was an author and co-author 795 scientific papers/publications between the periods 1975-2019.

Prof. Dr. Ahmet Ömer Koçak, (Professor of Zoology, Dr. Sci.) founder and owner of the "Centre for Entomological Studies, Ankara (CESA)", Editor of the international serials Priamus, Priamus, Supplement Miscellaneous Papers, Memoirs. Cesa NewsIconographia Insectorum (Series A-D).

Numerous expeditions have been organized and realized by the Cesa. The scientific materials (approx. 230,000 specimens) are preserved in the collections of Cesa.

(http://www.members.tripod.com/entcesa/Intent.pdf).

Scientific Activities and Research Interest of Prof. Dr. A.Ö.KOÇAK Ecology, fauna, distribution, zoogeography, check-list, taxonomy, nomenclature and morphology of Insecta (esp. Lepidoptera, Orthoptera, Homoptera, Neuroptera) of the Old World (especially the countries in Europe, Middle East, Central Asia, South East Asia, Philippines, East Africa (Ethiopia) and South Africa. See also Palaearctic Region; Nearctic Region; Afrotropical Region; Neotropical Region; Orientalic Region; Australic Region

Scientific Responsibilities of Prof. Dr. A.Ö. KOÇAK:Editor of the Serials of CESA. Curator of the collections of CESA.

Private Expeditions in Turkey and Abroad of Prof.Dr. A.Ö.KOÇAK:

Numerous expeditions in Turkey between the years of 1966 and 2010.

In abroad: Balkan states (Macedonia, Serbia, Bosna-Herzegowina, Croatia, Slovenia, Bulgaria) between the years of 1978 and 1990; Austria, Germany, Italy, Switzerland and France between 1978 and 1979; Pakistan in 1987; Northern Cyprus in 1989; North Iran and Turkmenistan, Macedonia in 1994; Ethiopia in 1996 (two times); The Philippines in 1996, Kazachstan and Kyrgyzistan in 1999 and 2000; South Africa (Soutpansberg) in 2003 and 2004 (four times); Uighur A.R. (China); Thailand (Chiang Mai) in 2005 and 2006 (three times).

J.Het.Turk.

"*Journal of the Heteroptera of Turkey*"

ISSN: 2687-3249

***J.Het.Turk.*, Volume 3, Issue 1, May, 2021**

Table of Contents

J.Het.Turk.
Journal of the Heteroptera of Turkey

ISSN 2687 - 3249 (online edition)

May, 2021
Volume 3, Issue 1

Research Article

Doğu Anadolu bölgesinde (Türkiye) *Lygaeus equestris*'in ekstrem fenolojik kaydı ve diğer bazı ekolojik parametreleri hakkında

Suat KIYAK

Gazi Universtiy, Faculty of Sciences, Department of Biology, 06500 Teknikokullar, Ankara, TURKEY
E-mail: skiyak@gazi.edu.tr ORCID iD: 0000-0001-8167-8283

ÖZET: Bu çalışmada, Doğu Anadolu Bölgesinden *Lygaeus equestris* (L.,1758) türünün kış mevsiminde gözlenen aktif uçuş kaydı verilmiştir. Araştırma Elazığ ili sınırlarında yer alan Hazar Gölü kıyısında 2019 yılında Aralık ayının 19'unda gerçekleştirilmiş ve *Lygaeus equestris* (L.,1758) örneği gözlenmiştir.
Çalışmada yıllık uçuş zamanları çizelge haline getirilmiş, ayrıca türün; Türkiye dağılışı, tercih ettiği rakım aralığı, habitat ve konukçu bitkileri de verilmiştir.

ANAHTAR KELİMELER: *Lygaeus equestris* (L.,1758), Lygaeidae, Heteroptera, fenoloji, ekoloji, Türkiye

About on the extreme phenological record and some other ecological parameters of *Lygaeus equestris* (L.,1758) (Het., Lygaeidae) in the eastern anatolia region of Turkey

ABSTRACT: In this study, active flight record of *Lygaeus equestris* (L.,1758) species from Eastern Anatolia Region observed in winter is given. The research was carried out in 19 December 2019 on the shore of the Hazar Lake, located on the borders of the Elazig province, and an example of *Lygaeus equestris* (L.,1758) was observed.
In the study, flight times were tabulated. In addition, distributions, localities, altitudes, habitat information and host plants in Turkey are given.

KEY WORDS: *Lygaeus equestris* (L.,1758), Lygaeidae, Heteroptera, phenology, ecology, Turkey

To cite this article: Kıyak, S., 2021, Doğu Anadolu bölgesinde (Türkiye) *Lygaeus equestris*'in ekstrem fenolojik kaydı ve diğer bazı ekolojik parametreleri hakkında. *J.Het.Turk.*, 3 (1): 1-10
DOI:10.5281/zenodo.4822002
To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A1.pdf
Received: Apr 7, 2020; **Revised:** Apr 17, 2020; **Accepted:** Apr 29, 2020; **Published online:** May 31, 2021

GİRİŞ

Aşağıda bazıları özetlenmiş araştırmalarda *L. equestris* (L.)'in yıllık jenerasyonları, aktif uçuş peryotları ve hibernasyona giriş/çıkış gözlemleri ile ilgili sonuçlar ele alınmıştır.

Buna göre bu türün örnekleri ağustos ayının sonuna doğru ergin evrede kışlayacağı kışlaklara doğru pre-hibernasyon uçuşu gerçekleştirerek göç ederler. İlkbahar mevsiminde ise post-hibernasyon uçuşlarını gerçekleştirerek kışlak alanlarından çıkar. "*Lygaeus equestris* (L.,1758), hibernasyon alanlarına gidiş-dönüş göç uçuşları gerçekleştirmektedir" (Solbreck, 1971).

L. equestris (L.)'in diyapoza girmek üzere sonbaharda kışlaklara göçünün, sonbaharda sıcaklık, besin ve diğer ekolojik faktörlerin etkisi ile başladığı bilinmektedir.

Bu türün fenolojisi, ilkbahar ve sonbahar göçleri, popülasyon dinamiği ile ilgili bazı çalışmalara literatür araştırmalarında rastlanmaktadır (Dingle and Drake, 2007; Hack and Rubenstein, 2001; Solbreck, 1976; Solbreck & Sıllén-Tullberg, 1990; Dingle, 1982; Zobar, Kıvan, 2005). Palearktik bölgede özellikle *Lygaeus equestris* (L.,1758)'in kışlaklara göç davranışı, popülasyon dinamiği ve fenolojisi ile ilgili çalışmalardan bazıları gözden geçirilmiş (Solbreck, 1971,1972, 1976, Solbreck ve Kugelberg,1972,SolbreckveSillen-Tullberg, 1981,1990) ülkemizde türün fenolojisine dair literatüre rastlanmamıştır.

Solbreck (1985); "*L. equestris* (L.)'in İsveç' teki kireçtaşı çıkıntılarında, birkaç metrekarelik alanda bulunan *Asclepias* sp. bitkisi içeren habitat adalarına göç ederek kışladıkları"ndan bahsetmektedir.

Solbreck (1976) yayınladığı bir diğer makalede, "*L. equestris* (L.)'in diyapoz giriş/çıkış sırasında gerçekleştirdiği göç uçuşlarını modellemeye, tarif etmeye ve hava koşullarıyla ve böceğin davranışsal adaptasyonlarıyla ilişkilendirme" ye çalışmaktadır.

Solbreck ve Kugelberg (1972)'e göre; 'göç' *L.equestris* (L.)'in sonbaharda diyapoza giriş ve ilkbaharda diyapozdan çıkış uçuşları olarak gerçekleşmekte olup, genellikle gıda sıkıntısı ile ilişkili görünmektedir.

"Prehibernasyon öncesi ve sonrası göçlerde binlerce *L.equestris* (L.) örneği belirli bir günde birkaç saat içinde kışlak alanına ulaşabilir veya kışlaktan ayrılabilir. Hava şartları, hem ontogenetik gelişimi hem de uçuş davranışını etkileyerek, göç uçuşlarının zamanlamasını da güçlü bir şekilde etkiler" (Solbreck 1972).

Hack ve Rubenstein (2001) bu göçlerin besin-iklim-diyapoza bağlı ilişkisi hakkında özetle şunları ifade etmişlerdir: "*L. equestris* (L.)'in yaz mevsiminde bulundukları beslenme ve üreme alanlarından birkaç kilometre uzaklıktaki daha iyi korunan alanlara mevsimsel hareketler yaptıklarını, göç ettikleri korunaklı bölgelerde (kışlak) "diapause"'a girdiklerini, beslenme döneminde depoladıkları yağ sayesinde kışın hayatta kalıp ilkbaharda diyapozdan çıktıklarını bildirmişlerdir. Kışlaklara çekilen bireyler belirli bölgelerde gruplar/topluluklar haline bulunabilirler. Diğer göçmen türlerde olduğu gibi göç; bu türün de, zengin, ancak mevsimsel olarak değişken habitatlardan farklı mevsimlerde faydalanmasına izin vermektedir. Birçok birey çok özel beslenme ve yetişme şartlarına gereksinim duyduğundan; sıcaklık, nem ve ışık seviyelerindeki küçük mevsimsel değişiklikler olduğunda bile, bireylerin yerel koşulların iyileşmesini bekleyebileceği alanlara (yani diyapoz alanları/kışlak) göç etmelerini tetiklemek için yeterli olabilir".

Holopalearktik bir tür olan *Lygaeus equestris* (L.,1758) 'in (Péricart, 1999, 2001) Önder ve ark. (2006)'na göre Türkiye'de çok geniş bir yayılışı vardır.

Türün konukçu bitkileri oldukça fazla olup, bazı kültür bitkilerinde popülasyon yoğunluğuna bağlı olarak önemli zarar oluşturduğu da literatür kayıtlarında verilmiştir. Zobar ve Kıvan (2005)'ın literatüre dayalı olarak bildirdiğine göre: "... geniş bir konukçu listesine sahip olmasına rağmen ekonomik önemde zararlı bir tür olarak bilinmemektedir. Ancak, 1970'li yıllarda özellikle tıbbi bitkilerden

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

Artemisia maritima, *A. absintium*, *Digitalis amandiana*, *D. chinensis*, *Pyrthrum cinerariaefolium*, *Lysimachia vulgaris*, *Echinops sphaerocephalus*, *Rheum capsicum*, *Centaurea sibirica* türlerinde zarar meydana getirdiği kaydedilmiştir. Macaristan'da 2001 yılında ayçiçeklerinde *L. equestris*' in beslenmesi sonucu linoleik asit oranında % 2.5'lik bir artışa neden olarak zarar meydana getirdiği bildirilmektedir. Yurdumuzda da Şanlıurfa'da antep fıstıklarında zararlı türler arasında *L. equestris* kaydedilmiştir".

Bu bilgiler ışığında türün, iklim şartlarına ve aynı zamanda besinin varlığı/kıtlığına bağlı olarak pre-hibernasyon/post-hibernasyon göç uçuşlarına geçtiği ve diyapoz ile olumsuz şartları atlattığı görülmektedir. Dolayısı ile sıcaklık, yağış ve besin gibi faktörler türün fenolojisine etki eden ana faktörler olarak görülmektedir.

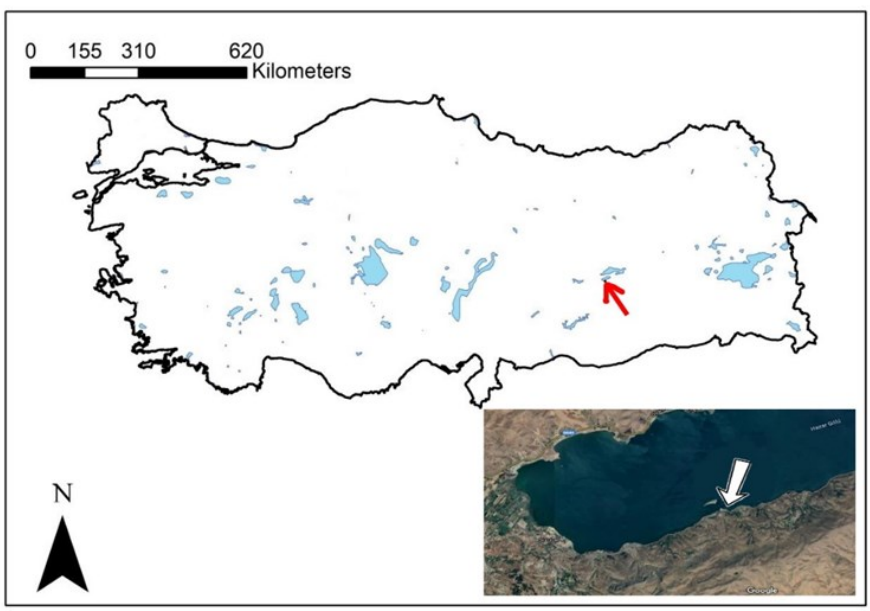
MATERYAL ve METOT

Bu çalışma doğu anadolu bölgesinde yer alan Elazığ il sınırları içerisinde yer alan Hazar gölünün kıyı bölgesinde 19.12.2019 tarihinde gözlenen ve toplanan örneğe dayalı olarak yapılmıştır (Harita 1)

İncelenen materyal: Sivrice-Hazar gölü / Elazığ, 38.458169 K, 39.369464 D, 19.12.2019, 1220 m, 1 örnek.

2019 yılı aralık ayında yapılan arazi çalışması sırasında uçuşu gözlenen ve toplanan Lygaeid örneği (Şekil 1) etil asetatlı öldürme kavanozunda öldürülerek böcek zarfı içerisinde laboratuara getirilmiştir. Stereo binoküler mikroskop altında tür teşhisi Stichel (1957-1962)'e göre yapılmıştır. Teşhis işlemi tamamlanan örnek standart müze materyali tipinde etiketlenerek muhafaza altına alınmıştır. Türe ait örneğin *Lygaeus equestris* (L., 1758) olduğu belirlenmiştir.

Bu çalışmada türe ait örneklerin toplama tarihleriyle ilgili kayıtlar literatürden süzülmüş ve 2019 yılında aralık ayındaki alan gezisinde gözlenen ve toplanan *Lygaeus equestris* (L., 1758) örneğinin kaydı da dahil edilerek, türün ülkemizdeki fenolojik durumu ve aktif uçuş peryotları çizelge haline getirilerek verilmiştir (Tablo 1). Bu çizelgede her bir ay 4 haftaya ayrılmış, türe ait kayıtların toplandığı tarihe karşılık gelen hafta işaretlenerek *Lygaeus equestris* (L.,1758) türünün Türkiye'deki aktif uçuş zamanları,



Harita 1. Elazığ, Sivrice: Hazar gölü güneyinde *Lygaeus equestris* (L.,1758)'in toplandığı lokalite (kırmızı/beyaz ok ile işaret edilen nokta). (Uydu haritası: Google map)

Şekil 1. Elazığ, Sivrice: Hazar gölü güneyi.*Lygaeus equestris* (L.,1758). (Foto: S. Kıyak)

Şekil 2. Elazığ, Sivrice: Hazar gölü güneyi. *Lygaeus equestris* (L.,1758)'in gözlendiği ve toplandığı lokalite. (Foto: S. Kıyak)

dolayısı ile fenolojisi ortaya konulmaya çalışılmıştır.

Bu makalede *Lygaeus equestris* (L.)'in, Türkiye'deki yayılışı, tercih ettiği habitat bilgileri, konukçu bitkileri, vertikal dağılışı, fenolojisi gibi bilgiler aşağıda sıralanan literatür kayıtlarına dayalı olarak verilmiştir: Hoberlandt, 1955; Altınayar,1981; Aysev,1974; Lodos ve ark., 1978, 1982; Yiğit ve Uygun, 1982; Kıyak 1990; Kıyak ve Çağlar,1991; Çağlar,1992; Kıyak, 1993; Kaya ve Hıncal,1991; Lodos ve Ark., 1999; Önder ve ark., 2006; Özsaraç ve Kıyak, 2001; Kıyak ve Ark., 2004; Zobar ve Kıvan, 2005.

3. ARAŞTIRMA BULGULARI

L. equestris (L., 1758)'in ülkemizdeki dağılışı, konukçu bitkileri, toplama lokalitelerine ait rakım bilgisi ve fenolojisine ait veriler aşağıda yer almaktadır:

a)Türün Türkiye Dağılışı:

Literatürlere dayalı olarak türün bilinen il ve lokalite bazında dağılış kayıtları: Adana (Feke, Gavur dağları, Bürücek, Toros dağları, Misis, Pozantı, Saimbeyli, Tufanbeyli-Gezbeli), Afyon (Dinar, Kocatepe, Başmakçı yaylası), Ağrı (Ağrı dağı), Aksaray (Ihlara Valley), Antalya (Akseki, Alanya, Merkez-Saklıkent, Elmalı, Kaş-Sinekçibeli, Kumluca-Olimpus, Manavgat, Serik), Ankara (Ayaş, Bağlum, Beypazarı, Çubuk, Elmadağı, Kalecik, Kızılcahamam-Soğuksu milli parkı, Nallıhan, Polatlı, Şereflikoçhisar, Beynam, Gölbaşı-Mogan gölü), Aydın(Nazilli, Çine, Koçarlı, Söke, Samsun dağı, Germencik), Balıkesir (Susurluk, Bandırma), Bartın (Merkez), Bilecik(Gölpazarı, Söğüt), Bolu (Mengen), Burdur, Bursa (Keles), Çanakkale (Çan, Gökceada), Çankırı (Merkez, Çerkeş, Eskipazar, Yapraklı), Çorum (Alaca, Merkez, İskilip, Laçin, Osmancık), Denizli(Tavas Vakıf köyü ve Karahisar köyü), Diyarbakır (Ergani, Karacadağ), Edirne, Elazığ(Hazar gölü) Erzurum (Hınıs), Erzincan (Tercan), Edirne, Eskişehir (Mihalıççık, Sarıcakaya), Gaziantep (Merkez, İslahiye, Yavuzeli, Akbez), Hatay (Hassa, Altınözü, Merkez, Kırıkhan, Samandağ, Yayladağı), Isparta (Gönen, Keçiborlu, Eğirdir), İçel (Çamlıyayla, Erdemli, Gülnar, Mut, Tarsus), Iğdır (Aralık), İstanbul (Büyükada Belgrad ormanı, Polu çiftliği), İzmir (Çeşme, Dikili, Narlıdere, Bornova, Ödemiş-Bozdağ, Karabel, Menemen, Ilıca, Selçuk, Gümüşsu, Yamanlar dağı, Bayındır), Kahramanmaraş (Ahır Dağı, Andırın, Elbistan, Göksun, Nurhak Dağı, Pazarcık), Karabük (Merkez, Safranbolu), Karaman (Merkez, Ermenek), Kars (Zardanes, Sarıkamış, Kağızman), Kastamonu (Merkez, Taşköprü, Tosya), Kayseri (Erciyes Dağı, Hisarcık), Kırşehir (Malya), Kırklareli, Konya (Beyşehir, Bozkır, Doğanhisar, Ereğli, Seydişehir, Sultan dağları), Kilis (Merkez), Kütahya (Tavşanlı, Altıntaş),Malatya(Yeşilyurt), Manisa (Kırkağaç, Kula, Alaşehir, Salihli), Muğla(Marmaris, Bodrum, Fethiye, Köyceğiz, Zorlar, Milas, S.yayla), Muş (Aşat), Nevşehir (Gülşehir), Niğde (Bor, Ulukışla), Rize (Çamlıhemşin, Çat düzü), Sinop (Merkez), Tekirdağ, Uşak, Yozgat (Sarıkaya, Sorgun) Zonguldak.

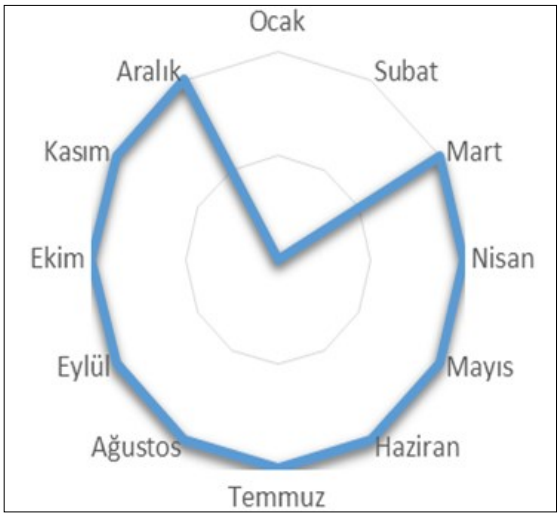
b)Fenolojisi:

Ülkemizde *Lygaeus equestris* (L.)'in fenolojik verileri literatürlerden tespit edilmiş ve türün aktif uçuş faaliyetinin bu çalışmaya kadar Mart ortası-Aralık ayı başlangıcı aralığında olduğu görülmüştür (Tablo 1, Şekil 3).

Literatür kayıtlarındaki en erken fenolojik veri 19/03/1975 tarihinde Lodos et al (1978) tarafından İzmir-Bornova'dan verilmiştir. En geç veri ise 06/11/1966 ve 26/11/1967 tarihinde Aysev (1974) tarafından İzmir-Çeşme'den verilen kayıt ile yine Aysev (1974) tarafından 05/12/1967 tarihinde *Nerium oleander* konukçusundan İzmir Karabel'den verilen kayıttır.

Buna göre yıllık aktif uçuş başlangıcı mart ayının ikinci yarısı ile başlamakta, aralık ayının ilk haftası olarak bitmektedir. Ancak bu kayıtlar İzmir menşelidir, bu ilimiz ılıman iklime sahiptir. Dolayısı ile örnek kaydı verilen bu lokalitede; hem sıcaklık değerleri açısından, hem de buna bağlı olarak besinin ortamdaki varlığı açısından aralık-mart ayları arasında hibernasyona giriş ve çıkışın gerçekleşmesi mümkün olabilir.

Şekil 3. Türkiye'de *Lygaeus eguestris*(L.) türünün aktif uçuşuna dair fenoloji grafiği



Bu çalışmamıza konu edilen gözlem yapılana kadar, kış aylarında karasal iklimin ve çetin kış şartlarının hüküm sürdüğü doğu anadoluda ne geç sonbahar ve ne de kış aylarında bu türe ait herhangi bir kayda rastlanmamıştır. İlk defa bu çalışma ile Hazar gölünün güney sahil kesiminde 19 aralık 2019 tarihinde saat 10:15'de havanın açık ve güneşli, sıcaklık değerinin 9°C olduğu bir günde türe ait örnek gözlenmiş ve kayıt altına alınmıştır.

Bu türün bu çalışma ile verdiğimiz yeni ve ekstrem fenolojik kaydının, 2019' yılında hüküm süren iklim şartlarından ve sıcaklığın bağıl yüksekliğinden kaynaklandığı düşünülmektedir.

c)Habitat:

Yapılan çalışmalarda yer alan habitat bilgileri, türün habitat tercihindeki çeşitliliği göstermektedir:

Hayvan gübresi, Step (otsu step, kserofil step, alpin otsu step), toprak üzeri, akarsu kenarı otsu formasyonu, *Quercus* sp., koruluğu, kültür alanı (sebze, meyve, ekinlik alan), orman formasyonu (*Pinus* sp. ağaçlandırma alanı, karışık orman formasyonu (*Pinus nigra – Populus tremula, Pinus nigra – Quercus* sp. bitki birlikleri), çalı formasyonu (makilik), orman - step geçiş zonu, kültür alanı-step geçiş zonu.

Bu çalışmada ise türe ait örnek aktif uçuş sonrası ahşap bir yapı üzerine konmuş ve buradan toplanmıştır. Toplama alanında otsu formasyon, *Salix alba* ve *Populus* sp., ağaçları, tragakantik steb hakimdir (Şekil 2).

d)Konukçu Bitkileri:

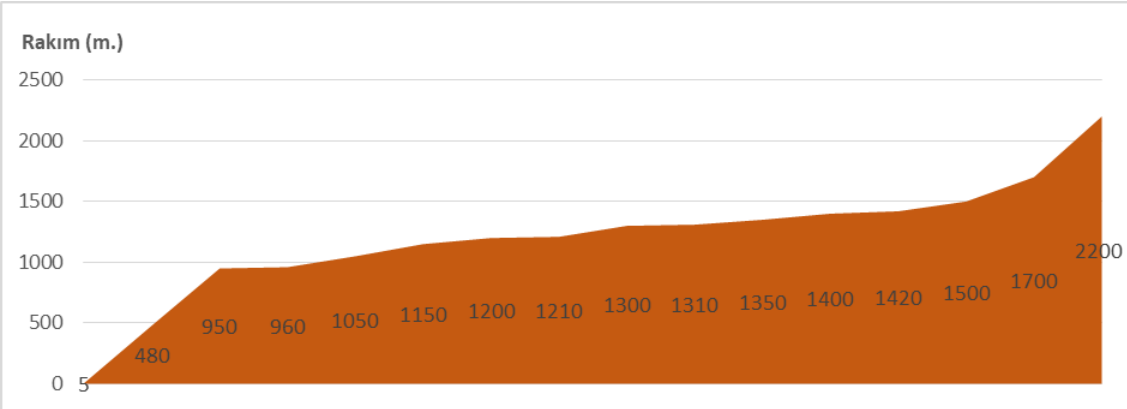
Aşağıda verilen konukçular, türün konukçu bitkilerinin çeşitliliği göstermektedir:

Achillea odorata, Adonis sp., *Aethionema* sp., *Anthemis* sp., *Astragalus* sp., *Cardaria draba, Centaurea* sp., *Cirsium* sp., *Chenopodium* sp., *Convolvulus* sp., *Cyctopteris fragilis, Cydonia vulgaris, Erodium* sp., *Elaeagnus orientalis, Euphorbia* sp., *Gundelia tournefortii, Heracleum apiformis, Juniperus* sp., *Lactuca serriola, Lens culinaris, Malus sylvestris ssp. milis, Medicago sativa, Melilotus* sp., *Nerium oleander, Nigella sativa, Onopordun* sp., *Olea europaea, Pimpinella anisum, Pinus* sp., *Pinus nigra, Poaceae, Prunus amygdali, Pyrus communis, Peganum harmala, Pinus* sp., *Pyrus communis, P. malus, Pistacia vera, Paliurus orientalis, Platanus* sp., *Populus* sp., *Prunus armeniaca, Prunus persica P. domestica, Quercus* sp., *Quercus pubescens, Rhus* sp., *Rosa* sp., *Rubus* sp., *Rumex* sp., *Salix* sp., *Sambucus nigra, Seseli hippomarathrum, Sinapis* sp., *Solanum lycopersicum, Spinacia oleracea, Tamarix* sp., *Taraxacum koksaghyz, Triticum, Umbelliferae, Verbascum, Vincetoxicum officinale, Vicia* sp., *Vicia faba, Vitis vinifera, Vitex sp.*

d)Vertikal yayılışı:

Literatür verileri ve araştırmalarımızdan yola çıkarak, *Lygaeus equestris* (Linneaus, 1758) türünün yukarıda Türkiye yayılışı başlığı altında sıralanan lokalitelerden elde edilen vertikal yayılışları ortaya konulmuş olup, türün ülkemizde 5m ile 2200m rakımlar aralığında vertikal yayılışa sahip olduğu belirlenmiştir. Türün vertikal yayılışı grafikte (Şekil 4) görülmektedir.

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)



Şekil 4. Türkiye'de *Lygaeus equestris* (Linneaus, 1758)'in vertikal yayılış grafiği

SONUÇ VE TARTIŞMA

Bu çalışmada, Hazar Gölü (Elazığ)'nün güney kıyısındaki lokalitede aralık ayında gözlenen ve toplanan *L. equestris* (L.)'in pre-hibernasyon dönemine ait ekstrem tarihli ilk fenolojik kaydı ile, bu türün Türkiye'deki diğer kayıtları, dağılışı, fenolojisi ve konukçu bitkileri değerlendirilmiştir.

Bu çalışmada, Türkiye'nin *L equestris* (L.) türünün kayıtlarından aktif uçuş bilgileri incelenmiş, türün toplama verileri ile ilgili farklı tarihler bulunmakla birlikte uçuş peryodu ile ilgili bilgilerinin sınırlı olduğu da tesbit edilmiştir.

Bu çalışmadaki aktif uçuş peryoduna bakıldığında *L. equestris* (L.)'in Türkiye'den verilen önceki kayıtlara göre sonbahar göçünde bir gecikmenin söz konusu olduğu belirlenmiştir. Bu durumun iklimsel ve besin faktörü gibi bazı ekolojik faktörlerdeki optimal şartların 2019 yılında sonbahar sonunda da devam etmesinden kaynaklanmış olmalıdır. Kışın ilk ayı olan aralık ayının ortasından sonra dahi türün hibernasyona henüz girmeyip aktif uçuş geçekleştiği de bunu göstermektedir.

Belki bu uçuş, göç ile ilgili olmayan önemsiz uçuş olarak da değerlendirilebilir. Yine de bu durumun iklim değişikliği ile ilişkilendirilebilir.

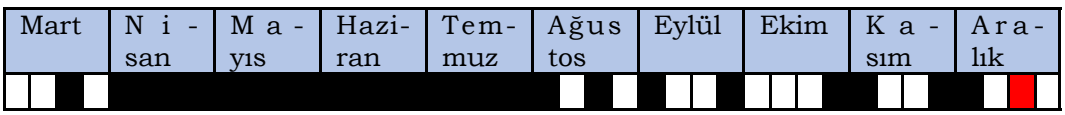
1947 yılından bu yana Türkiye'de yapılan faunistik ve sistematik araştırmaların sonuçlarından yola çıkılarak bu türün aktif uçuş peryodu ile ilgili bir tablo hazırlanmıştır (Tablo 1). Tablodan da anlaşılacağı üzere *L. equestris* (L.)'in hibernasyon sahası olarak değerlendirilen çalışma alanında, aralık ayının üçüncü haftasına rastlayan bir günde henüz diyapoza girmediği görülmektedir.

Dingle (1982)'nin Solbreck (1971, 1972, 1976) Solbreck & Kugelberg (1972) Solbreck & Sillen-Tullberg (1981)'e dayanarak bildirdiğine göre özet olarak; "*Lygaeus equestris* kuzey Avrupa'daki diyapoz alanları ile konukçu bitkilerin bulunduğu alan arasında ve sadece birkaç yüz metre göç etmektedir. Bu araştırmalarda türün göç - "hibernasyon" durumu detaylı olarak incelenmiştir. Kış aylarında, bireyler uçurumlardaki korunaklı kaya çıkıntılarında, özellikle taş yapılarda diapoz için kümelenmektedir. İlkbaharda mayıs ayında kışlak alanlardan çıkıp beslenme alanlarındaki konukçu bitkilerin çiçek açmaya başladığı çevredeki araziye göç eder. Dişiler konukçu bitkilere yumurta bırakmaya başlar. Yumurtadan çıkan yeni nesil yaz boyunca olgunlaşır ve sonbaharda kış uykusu için hibernasyon sahalarına, diyapoza girmek üzere göç ederler".

Solbreck (1976) çalışmasında hem kendi araştırmalarının sonuçlarına, hem de bu türün kışlaklara gidiş/dönüş göçleri ile ilgili olarak yayınlanmış literatürlere (Puchkova,1954;Puchkov, 1969; Marikovskij, 1970;Gaunitz,1937; Solbreck

1971; Solbreck ve Kugelberg, 1972) dayalı olarak özetle şunları belirtmektedir: "*L. equestris* (L.) türünün ağustos ayı ortalarından itibaren 4-6 haftalık bir peryotta hibernasyon alanlarına doğru uçuş ve göç gerçekleştirdiğini, en yoğun olarak 5 günlük bir dönemde göçün büyük bir bölümünün gerçekleştiğini (günlük 10.000 ergin birey), güneşli günlerin göç üzerinde olumlu etkisi olduğunu" belirtir. Yine Solbreck (1976): "Hibernasyondan çıkışlarının Nisan ayı ortası, mayıs ayı başı ya da kimi yıllarda mayıs ortalarında gerçekleştiğini, ilkbaharda göç eden bireylerin etrafa dağılarak çiçeklerle beslendiklerini, ilkbahar göçünün sonbaharda-kinden daha kısa sürede gerçekleştiğini" ifade etmektedir.

Tablo 1. Türkiye'de L. equestris'in fenolojisi ve aylara göre aktif uçuş zamanları çizelgesi*
*(■:Literatür kaydı, ■ bu araştırmadaki kayıt)



Ülkemizdeki toplama verilerinin haftalık düzende aktif uçuş dönemleri olarak işaretlendiği Tablo (1)'da; Mart ayının 3. haftasından Aralık ayının ilk haftasına kadar türe ait bireylerin habitatlarda varlığı ortaya konulmuştur. *L. equestris* (L.,)'in nisan ayı başlangıcından ağustos ayının ilk haftası sonuna kadar kesintisiz olarak varlığı tesbit edilmiş, diğer aylarda ise tabloda işaretlendiği gibi mevcudiyeti kesikli olarak işaretlenmiştir.

İlkbahar göçünü kısa sürede tamamlayan türe ait örneklerin beslenme ve üremeleri habitatlarındaki besinin miktar ve dağılımına bağlıdır. Ağustos başlarından itibaren tercih edebilecekleri habitatlar ve konukçuların ilerleyen aylardaki iklim şartlarına bağlı olarak azalmasının göç davranışı üzerinde önemli bir rolü vardır.

Sonuç olarak; aralık 2019'daki gözlem sırasında Hazar Gölü'nün kıyı bölgesinde aktif uçuş gerçekleştiren *L. equestris* (L.) örneğinin pre-hibernasyon uçuşunun, hem bu alanda hem de Türkiye'de aralığın 3. Haftası gerçekleşmiş olması gecikmiş bir kayıt olarak önemlidir. Ve türün fenolojisine dair ilginç bir kayıttır. Kış mevsiminde hava sıcaklığının çok düşük olduğu doğu Anadolu'da, Elazığ ilinde (Tablo 2) kış uykusu göçünün sonbaharın başlarında ve çok daha erken başlaması beklenirken, türün aralık ayının 3 haftası sonlarında halen aktif uçuş döneminde gözlemlenmesi ve henüz hibernasyon sahasında diyapoza girmemesi açısından bu kayıt önem arz etmektedir.

Tablo 2. Elazığ ili için 1938-2018 yılları meteorolojik veriler ortalaması (Url 1)

ELAZIG	Ocak	Şubat	Mart	Nisan	Mayıs	Haziran	Temmuz	Ağustos	Eylül	Ekim	Kasım	Aralık	Yıllık
	Ölçüm Periyodu (1938 - 2018)												
Ortalama Sıcaklık (°C)	-0.9	0.6	5.5	11.9	17.2	22.7	27.1	26.9	22.0	14.8	7.4	1.8	13.1
Ortalama En Yüksek Sıcaklık (°C)	2.9	5.0	10.8	17.8	23.6	29.7	34.2	34.2	29.4	21.4	12.6	5.6	18.9
Ortalama En Düşük Sıcaklık (°C)	-4.0	-3.1	0.9	6.4	10.9	15.3	19.4	19.2	14.6	8.9	3.1	-1.3	7.5
Ortalama Güneşlenme Süresi (saat)	2.6	3.6	5.0	6.5	8.7	11.0	11.7	11.0	9.2	6.7	4.5	2.3	82.8
Ortalama Yağışlı Gün Sayısı	12.1	11.5	12.4	12.2	10.9	4.1	1.1	0.7	2.2	7.2	9.1	11.7	95.2
Aylık Toplam Yağış Miktarı Ortalaması (mm)	40.8	42.3	53.5	63.3	51.8	12.0	2.2	0.7	7.8	40.5	48.7	44.6	408.2
	Ölçüm Periyodu (1938 - 2018)												

REFERENCES

Péricart, J.,1999, *Hémiptères Lygaeidae euro-méditerranéens, Faune de France*, 3 volumes: 84A: 1-468; 84B: 1-453; 84C: 1-487, Paris: Fédération Française des Sociétés de Sciences Naturelles.

Péricart, J., 2001, *Family Lygaeidae Schilling, 1829, Seed-bugs: 35-220*, In: Aukema B. & Rieger C. (eds.), *Catalogue of the Heteroptera of the Palaearctic Region,* Vol. 4, 346 p. Amsterdam: The Netherlands Entomological Society.

Önder, F., Karsavuran, Y., Tezcan, S. & Fent, M., 2006, *Heteroptera (Insecta) Catalogue of Turkey*, Ege Üniversitesi Ziraat Fakültesi, İzmir -Turkey. 164 p. [in Turkish].

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*, supl. 3 [1955]: 1-264.

Kıyak, S., 1990, Systematisch- Oekologische Untersuchungen Ueber Die Wanzen (Insecta: Heteroptera) Aus Dem Gebiet Hazar- See, Maden und Ergani (Prov.Elazig)-I, *J.Biol. Fac. Sci. Arts Gazi Univ.* 1:43-95; II. *J.Biol. Fac. Sci. Arts Gazi Univ*. 1:97-144.

Altınayar, G., 1981, Orta Anadolu Bölgesi tahıl tarlalarındaki böcek faunasının saptanması üzerinde çalışmalar, *Bitki Koruma Bülteni*, 21 (2): 53-88.

Aysev, N.,1974, *Ege Bölgesinde Lygaeidae Familyası Üzerinde Sistematik Çalışmalar*, Zirai Mücadele ve Zirai Karantina Genel Müdürlüğü Nebat Koruma Müzesi,1974.

Lodos, N., Önder, F., Pehlivan, E., Atalay, R., 1978, *Ege ve Marmara Bölgesi Zararlı Böcek Faunasının Tespiti Üzerine Çalışmalar, Curculionidae, Scarabeidae (Coleoptera); Pentatomidae, Lygaeidae, Miridae (Heteroptera)*, T. C. Gıda-Tarım ve Hayv.Bakanlığı Zir.Müc. ve Kar.G. Müd. Basımevi, 301, Ankara

Lodos, N., Önder, F., Pehlivan, E., Erkin, E., Karsavuran, Y., Aksoy, S., 1982, Orta Anadolu ve Batı Karadeniz Bölgelerinin Böcek Faunasının Tespiti Üzerine Çalışmalar, Curculionidae, Scarabeidae (Coleoptera); Pentatomidae, Scutelleridae, Lygaeidae, Miridae (Heteroptera), TÜBİTAK, TOAG-336 Nolu proje Kesin Raporu, 51s.

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*, E. Ü. Basımevi, İzmir, IX:1-58.

Yiğit A. & Uygun, N., 1982, Adana, İçel ve Kahramanmaraş illeri elma bahçelerinde zararlı ve yararlı faunanın saptanması üzerinde çalışmalar, *Bitki Koruma Bülteni,* 22 (4): 163- 178.

Kıyak, S., & Çağlar, S. S.,1991, Über Heteropteren von Nord- und Nordostanatolien, M*isc. Pap.,* 11: 2-8

Çağlar, S. S., 1992, Beynam ormanı ve çevresiyle Çubuk ve çevresi Hemiptera kommunitesi üzerinde çalışmalar, Doktora Tezi, H. Ü. Fen Bil. Enst.

Kıyak, S., 1993, Über terrestrische Wanzenarten Von Soğuksu National Park, *Priamus*, 6 (3/4): 131-156

Kaya, N., Hıncal, P., 1991, Denizli ili mercimek alanlarında bulunan böcek faunası, *Türk Ento. Dergisi*, 15(3): 173-181

Stichel, W., 1957-1962, *Illustrierte Bestimmungs tabellen der Wanzen II. Europa (Hemiptera – Heteroptera Europae)*, Vol. IV.;1-830, Berlin

Zobar, H., Kıvan, M., 2005, *Lygaeus equestris* (L.) (Heteroptera: Lygaeidae)'in bazı biyolojik özellikleri, *Trakya Univ J Sci,* 6 (1): 59-62.

Dingle, H and Drake, v.A., 2007, What Is Migration?, *February 2007 / Vol. 57 No. 2: 113-121pp.* BioScience

Hack M.A. and Rubenstein, D. I., 2001, *Migration, Encyclopedia of Biodiversity,* Volume 4, by Academic Press.*Princeton University*

Dingle, H., 1982, Function of migration ın the seasonal synchronization of insects, *Ent. exp. & appl.* 31:36-48pp. *Ned. Entomol. Ver. Amsterdam*

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

Solbreck, C. 1971, Displacement of marked *Lvgaeus equestris* (L.) (Het.. Lygaeidae) during pre- and post-hibernation migrations, *Acta. Ent. Fenn.,* 28 : 74-83.

Solbreck, C.,1972, Sexual cycle, and changes in feeding activity and fat body size in relation to migration in *Lygaeus equestris* (L.) (Het.. Lygaeidae), *Ent. scand.* 3: 267 -274.

Solbreck. C.,1976, Flight patterns of *Lygaeus equestris* (Heteroptera) in spring and autumn with special reference to the influence of weather, *Oikos* 27 : 134-143.

Solbreck, C. & Kugelberg, O.,1972, Field observations on the seasonal occurrence of *Lygaeus equestris* (L.) (Het., Lygaeidae) with special reference to food plant phenology, *Ent. scand. 3 :*189-210.

Solbreck, C. & Sillen-Tullberg, B., 1981, Control

of diapause in a "monovoltine" insect, *Lygaeus equestris* (Heteroptera). *Oikos* 36: 68-74.

Solbreck, C. & Sillen-Tullberg, B., 1990, Population Dynamics of a seed feeding bug, *Lygaeus equestris*. 1. Habitat patch structure and spatial Dynamics, *Oikos* 58: 199–209.

URL1: https://www.mgm.gov.tr/veri_deger-lendirme/il-ve-ilceler-istatistik.aspx?k=A&m=ELAZIG (Erişim tarihi: 20 mart 2020)

J.Het.Turk.
Journal of the Heteroptera of Turkey

ISSN 2687 - 3249 (online edition)

May, 2021
Volume 3, Issue 1

Short Note

Thaumastocoris peregrinus Carpintero & Dellapé, 2006 (Hemiptera: Heteroptera: Thaumastocoridae) has reached the Greek island of Crete

Torsten van der Heyden

Immenweide 83, D-22523 Hamburg, Germany.
E-mail: tmvdh@web.de ORCID iD: 0000-0003-4138-7160

ABSTRACT: The first record of *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006 on the Greek island of Crete is reported. Information on the known distribution of the species in Europe is summarized.

KEYWORDS: *Thaumastocoris peregrinus*, first record, distribution, Crete.

To cite this article: van der Heyden, T., 2021, *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006 (Hemiptera: Heteroptera: Thaumastocoridae) has reached the Greek island of Crete, *J.Het.Turk.*, 3 (1):11-13
DOI:10.5281/zenodo.4822269
To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A2.pdf
Received: Dec 22, 2020; **Revised:** May 17,2021; **Accepted:** May 17, 2021; **Published online:** May 31, 2021

Thaumastocoris peregrinus Carpintero & Dellapé, 2006 (Hemiptera: Heteroptera: Thaumastocoridae), commonly known as the bronze bug, is a pest of eucalypts (Myrtaceae) (Novoselsky & Freidberg, 2016). In Europe, the invasive Australian species has been reported from mainland Italy (Laudonia & Sasso, 2012) and the Italian islands of Sicily (Carapezza, 2014) and Sardinia (di Lascio & Nannini, 2016), Portugal (Garcia et al., 2013), Spain (Vivas et al., 2015), Albania (van der Heyden, 2017), mainland Greece and several Greek islands (Petrakis, 2018) and Malta (Mifsud & Carapezza, 2020) so far.

The paper by Petrakis (2018) contains a map showing sampling sites with eucalypts in mainland Greece and on various Greek islands. While *T. peregrinus* was found at various examined sites in mainland Greece and on the Greek islands of Sifnos, Syros and Tinos (Cyclades), the species was not found on Crete.

Now, the presence of *T. peregrinus* on Crete can be reported: On 16.12.2020, Fotis Samaritakis photographed an adult specimen of *T. peregrinus* in a park in the village of Kounoupidiana, located in the municipality of Chania at the northwestern coast of the island (Fig. 1).

The photograph was uploaded to the online database iNaturalist (Samaritakis, 2020).

ACKNOWLEDGEMENTS

I would like to thank Fotis Samaritakis for allowing me to use his photo of *T. peregrinus* to illustrate this paper and for additional information about his finding.

REFERENCES

Carapezza, A., 2014, The arrival of one more Eucalyptus pest in Sicily: *Thaumastocoris peregrinus* Carpintero et Dellapé, 2006 (*Hemiptera Heteroptera Thaumastocoridae*), *Il Naturalista Siciliano*, S. IV, XXXVIII (1): 127-129.

di Lascio, A., Nannini, M., 2016, A survey of the bronze bug *Thaumastocoris peregrinus* on *Eucalyptus camaldulensis* in the site of its first recovery in Sardinia (Italy), *Communications in Agricultural and Applied Biological Sciences*, 81 (3): 307-308.

Garcia, A., Figueiredo, E., Valente, C., Monserrat, V.J., Branco, M., 2013, First record of *Thaumastocoris peregrinus* in Portugal and of the neotropical predator *Hemerobius bolivari* in Europe, *Bulletin of Insectology*, 66 (2): 251-256.

Laudonia, S., Sasso, R., 2012, The bronze bug *Thaumastocoris peregrinus*: a new insect recorded in Italy, damaging to *Eucalyptus* trees, *Bulletin of Insectology*, 65 (1): 89-93.

Mifsud, D., Carapezza, A., 2020, A new *Eucalyptus* pest in Malta: *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006 (Hemiptera: Heteroptera: Thaumastocoridae), *Bulletin of the Entomological Society of Malta*, 11: 129-132.

Novoselsky, T., Freidberg, A., 2016, First record of *Thaumastocoris peregrinus* (Hemiptera: Thaumastocoridae) in the Middle East, with biological notes on its relations with eucalyptus trees, *Israel Journal of Entomology*, 46:43-55.

Petrakis, P.V., 2018, First record of the bug *Thaumastocoris peregrinus* in Greece, *Entomologia Hellenica*, 27: 1-9.

Samaritakis, F., 2020, *Thaumastocoris peregrinus*. Photograph to be found on iNaturalist [Online database]. Available from: https://www.inaturalist.org/observations/66880973. (Accessed: 21.12.2020).

van der Heyden, T., 2017, The first record of *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006 (Hemiptera: Heteroptera: Thaumastocoridae) for Albania, *Revista gaditana de Entomología*, VIII (1): 133-135.

Vivas, L., Crespo, J., Jacinto, V., 2015, Primer registro de la especie invasora *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006 en España y nuevos datos para Portugal (Hemiptera: Thaumastocoridae), *BV news Publicaciones Científicas*, 4 (48): 30-35.

Figure 1. Specimen of *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006, Kounoupidiana, Crete, Greece, 16.12.2020. (Photo: Fotis Samaritakis).

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

JHT
J.Het.Turk.
Journal of the Heteroptera of Turkey
ISSN 2687 - 3249 (online edition)
May, 2021
Volume 3, Issue 1

Research Article

A scanning electron microscope study of the sensilla on antenna and mouthparts in *Eurygaster testudinaria* (Geoffroy, 1785) (Hemiptera, Heteroptera, Scutelleridae)

Damla Amutkan Mutlu[1], Irmak Polat[2], Hanife Gözüpek, Suat Kıyak[1], Zekiye Suludere[1]

[1]Gazi University, Science Faculty, Department of Biology, Ankara, 06500, TURKEY
[2]Çankırı Karatekin University, Science Faculty, Dep. of Biology, Çankırı, 18100, TURKEY

E-mails: damlamutkan@gazi.edu.tr, irmakyilmaz@gazi.edu.tr, skiyak@gazi.edu.tr, zekiyes@gazi.edu.tr

ORCID IDs: 0000-0002-4780-8520 (DAM), 0000-0001-7230-4589 (IP), 0000-0001-8167-8283 (SK), 0000-0002-1207-5814 (ZS)

ABSTRACT: In insects, there are many sensilla showing different structural features on the mouthparts and antennae. These sensilla act as the sensory organs of insects. Main functions of the sensilla in insects are chemoreception, mechanoreception, and thermohygrosensory properties. *Eurygaster testudinaria* (Geoffroy) (Hemiptera, Heteroptera, Scutelleridae) is a widespread species that is a perilous pest for agricultural areas. In this study, the sensilla on the mouth parts and antennae of *E. testudinaria* were investigated by using scanning electron microscope technique. In our results we obtained, we identifed four types of sensilla such as sensilla basiconica, peg-like sensilla, sensilla trichodea, sensilla campaniformia. Each sensilla type were divided into subtypes and numbered. We hope to contribute to similar studies in the future with this morphological study.

KEYWORDS: Insect, Heteroptera, chemoreceptor, mechanoreceptor, morphology, systematic, taxonomy

To cite this article: Amutkan Mutlu, D., Polat, I., Gözüpek, H.,Kıyak, S., Suludere, Z., 2021, A scanning electron microscope study of the sensilla on antenna and mouthparts in *Eurygaster testudinaria* (Geoffroy, 1785) (Hemiptera, Heteroptera, Scutelleridae), *J..Het.Turk.,* 3 (1):14-30
DOI:10.5281/zenodo.4823578
To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A3.pdf
Received: Apr 22, 2021; **Revised:** May 17, 2021; **Accepted:** May 20, 2021; **Published online:** May 31, 2021

INTRODUCTION

Sensilla, which is found in the mouth and antennae parts of insects, plays an important role in vital functions such as mating by identification of sex pheromones, feeding and finding a host alive (Isidoro et al., 2001; Fu et al., 2012; Cao and Huang, 2016; Faucheux et al., 2020). The mouthparts and antenna in

insects host many different types of sensilla that act as chemoreceptors and mechanoreceptors (Li et al., 2016). Most of these receptors are chemoreceptors (Brozek and Chlond, 2010). The researchers have classified the sensilla in insects into four major groups according to the sensory modality: gustatory, olfactory, mechanosensory and thermohygrosensory (Fernandes et al., 2008; Nowinskal and Brozek, 2017; Li et al., 2018). Some researchers classify olfactory sensilla and gustatory sensilla under the name of chemoreceptors (Brozek and Chlond, 2010). In addition, there are also varieties of sensilla such as trichoid, basiconic, plate-like, placoid, long hair-like and coeloconic when looking at external morphology (Slifer 1970; Altner and Prillinger 1980; Hallberg and Hansson 1999; Shields 2010; Nowinskal and Brozek, 2017). Besides, sensilla are divided into 3 major groups according to the presence of pores each with different functions: aporous, uniporous (terminal pores) and multiparous (wall pores) (Nowinskal and Brozek, 2017).

In the species belonging to the ordo Heteroptera (Hemiptera), the labial sensilla tracks the surfaces of the food sources such as plant and animals (Chapman, 1998; Brozek and Zettel, 2014; Parveen et al., 2015). The outer structure of the sensilla of insects shows variation among Hemiptera species (Brozek and Bourgoin, 2013; Nowinskal and Brozek, 2017; Taszakowski et al., 2019).

Insects perceive volatile chemicals in the air with their antennae (Carey and Carlson, 2011). Antennas are the primary sensory organs of insects and there are many different types of sensillas on them. These sensillas act as thermohygrorecertors, chemoreceptors and mechanoreceptors (Akent'eva, 2008; Fu et al., 2012; Brozek and Bourgoin, 2013; Freitas et al, 2020; Zhang et al., 2021). In species belonging to the order Hemiptera, antenna sensilla are used by the insect to recognize plants at a distance by olfactory ability (Brozek, 2013).

Hemiptera is a very large order that includes a wide variety of species. The piercing-sucking mouthparts of these Hemiptera species are a feature that allows them to feed on plant sap (Kanturski et al., 2017). Therefore, insects belonging to this ordo are generally known as plant pests (Hao et al., 2016).

Eurygaster is a holarctic genus of ordo Heteroptera (Hemiptera) which has 15 species (Kaplin and Burlaka, 2019). *Eurygaster testudinaria* (Geoffroy) (Heteroptera, Scutelleridae) is a species that belongs to this genus and has a wide distribution area. They have trans-Palaearctic distribution and have been recorded in Norway, Ireland, Finland, Great Britain, and Turkey in Europe, Tunisia and Morocco in Africa, Tajikistan, Kyrgyzstan, Kazakhstan, Uzbekistan, Japan, and Korea in Asia (Syromyatnikov et al., 2017; Kaplin and Burlaka, 2019). *E. testudinaria* has been recorded in meadows and on the species belonging the Cyperaceae family. Besides, it is also known to be a very dangerous pest for cereals (Linnavuori, 2008; Syromyatnikov et al., 2017).

The aim of this study is to divulge the morphological features of the sensilla of the mouth and the antenna parts according to their cuticular structures and to make the classification of them in *E. testudinaria*, an agricultural pest.

MATERIAL AND METHODS

The adult individuals of *Eurygaster testudinaria* were taken from field survey in Ayaş and Haymana in Ankara province in July, 2018 and carried to the laboratory in 2,5 L plastic bottles. The external structures of specimens were cleaned. The cleaned specimens were attached to SEM stubs after they were dried in air. Subsequently, the SEM stubs with specimens were coated with gold and observed in SEM (JEOL JSM 6060 LV). The micrographs were taken at

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

10kV accelerating voltage in different magnifications. All studies were carried out at Gazi University, Faculty of Science, Prof. Dr. Zekiye Suludere Electron Microscope Center.

RESULTS AND DISCUSSION

There are many sensory organs that determine different chemical substances and mechanical actions on the outer surface of the insects. Most of them are found on the mouthparts surface and can find food to feed on these various sensory organs. The others are found on the antenna surface and they can serve the functions of both smelling and touching (Blaney & Chapman, 1969; Cao & Huang, 2016). In this study, we revealed the sensilla morphology of the head including mouthparts, antenna and surface of the head in adult male and female *E. testudinaria* with scanning electron microscope (SEM). Different types of sensilla were observed on the surface of the mouthparts, the antenna, and the head. Each region of the mouth-parts and antenna was separately described and compared with those in previous studies. No obvious differences were noted between the mouthpart, antenna and head structure of female and male individuals.

The mouthparts in hemipteran species are composed of the labrum which is short and conical in shape, the labium which is long and segmented, and a labial groove in which mandibular and maxillary stylets are located, respectively (Wang et al., 2020). In the insect being studied (*E. testudinaria*), dorsal view of the species has shown that there is a three-segmented labium, labial groove, labrum, and stylet fascicle in mouth-parts. The defining feature of hemipterans is that it is a "stylet" which is sheathed within a modified labium (Figure 1A, 1B). In some species belong-ing to Hemiptera order, in Heteroptera suborder such as *Dolycoris indicus*, *Plautia crossota*, *Piezodorus hybneri*, *Eocanthecona furcellata*, *Perillus bioculatus* (Parveen et al., 2015), *Cheilocapsus nigrescens* (Wang et al., 2019), *Macrocheraia grandis*, *Physopelta quadriguttata*, *Physopelta cincticollis*, and *Physopelta gutta* (Wang et al., 2020) the mouthparts have a four-segmented labium.

In different Heteroptera species, while mouth parts are specified, the sensilla types on them are also shown. Various types of sensilla are determined unsymmetrically in each part, positioned on either sides of the labial groove or on the distal end of the labium in *E. testudinaria* (Figure 2).

The labrum (Lm) attaches to the anterior margin of the head and extends to the junction of the head and thorax in both sexes (Figures 1A, 1B). The region (proximal region) where it attaches to the head is wide and the free distal end is thinner than the proximal region (Figures 3A, 3B). While the proximal surface of the labrum has short dome-shaped protrusions (Figures 3C, 3D), its other surface is almost smooth and also light and transverse pits were found (Figures 3E, 3F). Plate-shaped structures are noticeable at the end edges of the labrum (Figures 3G, 3H). Sensilla have not been found in this area. The similar structures related to the labrum are reported in *M. grandis* (Heteroptera), *P. quadriguttata* (Heteroptera), *P. cincticollis* (Heteroptera), and *P. gutta* (Heteroptera) (Wang et al., 2020).

The labium (Lb) is long, slender, and three segmented. Its anterior surface is deeply concave to form a longitudinal channel due to containing the mandibular and maxillary stylets. Each segment of three-segmented labium varies widely morphologically. The middle of the first segment is concave, and the labrum extends into this area (Figures 4A, 4B). Although the apex of the first segment is smooth and has no sensilla (Figures 4A, 4B), there are many different sized sensilla in the middle part, and a great number of small protrusions (Figures 4C, 4D). Sensilla are in the same form as sensilla basiconica (Sb) and

J.Het.Turk., 3(1), Mayv 2021 (eISSN 2687-3249)

sensilla trichodea (St). Sensilla basiconica and sensilla trichodea are numbered according to the diagram in Figure 2. The last part of the first segment in labium is smooth in both sexes like in the apex. In the male individual, that area appears to be more swollen (Figures 4D, 4E).

The second and third segments of the labium have similar morphology along their length, but the second segment is narrower in contrast to the first and third segment. The surface of the junctions of the longitudinal channel in the second segment is differentiated as a plate (Figures 5A, 5B). The other surface is smooth and various sensilla are seen (Figures 5C-5F). There are four types of sensilla such as sensilla basiconica, sensilla trichodea, sensilla campaniformia, and peg-like sensilla in the second segment in both sexes (Figures 5C-5F).

A small canal structure was seen on the right and left edges of the junction of the second and third and the last segments in both sexes (Figures 6A, 6B). One sensilla campaniformia I (Sca1) and one sensilla basiconica V (Sb5) type sensilla were observed at the edges of both channels (Figures 6C, 6D).

In the third segment of the labium, a large number of sensilla basiconica I (Sb1), sensilla basiconica II (Sb2), sensilla basiconica III (Sb3), and basiconica V (Sb5) are interlaced on the surface (Figures 7A, 7B). They are quite straight with smooth surfaces. Apart from sensilla basiconica (Sb), sensilla trichodea III (St3) and sensilla campaniformia II (Sca2) type sensilla were also located in the third segment (Figures 7C-7F). The last part of the third segment is symmetrically divided into two lateral lobes (Figures 8A, 8B). There are many sensilla trichodea III (St3), sensilla trichodea IV (St4), and sensilla basiconica III (Sb3) type sensilla located on it (Figures 8C, 8D).

The antenna of *E. testudinaria* is composed of five segments in both sexes (Figure 9A, 9B). There were no significant differences in each segment between females and males. Four types of antennal sensilla, including four subtypes of sensilla basiconica (Sb), three subtypes of sensilla trichodea (ST), one type of peg-like sensilla (Ps), and one type of sensilla campaniformia (Sca) are observed along its surface (Figures 10-14).

The surface of the head in *E. testudinaria* has three types of sensilla such as St1, sensilla trichodea I; St2, sensilla trichodea II; Sca2, sensilla campaniformia II. These types of sensilla are shown in Figure 15. St1, sensilla trichodea I type sensilla is the most common type of sensilla on the surface of the head.

The labium of hemipterans plays an important role in recognizing foods using the sensory organs on its surface (Backus, 1988; Wang et al., 2019). Four types of sensilla on the tip and surface were observed on the labium of *E. testudinaria*. Each group of sensilla has different length and thickness; therefore, they were numbered in themselves. The most abundant sensilla on the labium are sensilla trichodea and sensilla basiconica. However, only sensilla trichodea on the labium was observed in *C. nigrescens* (Heteroptera, Miridae) (Wheeler, 2001; Wang et al., 2019). It has been stated that sensilla trichodea acts as mechanoreceptors to find nutrients, whereas sensilla basiconica type sensilla are involved in the movement of mouth parts (Liang et al., 2013; Gullan & Cranston, 2014; Wang et al., 2019). When we look at the sensors on the antenna, we observed four types of sensilla. These sensilla help insects to understand their environment. The feeding mechanism may be understood from the mouthpart morphology of insect species. The insect can choose the food

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

with the sensilla on the surface of the mouthparts. The diverse type, number and distribution of labial sensilla appear to be much more important because of being used as the morphological characteristics and presenting taxonomic and phylogenic data. In the light of the data we have obtained, we hope to contribute to future studies on insect mouthparts.

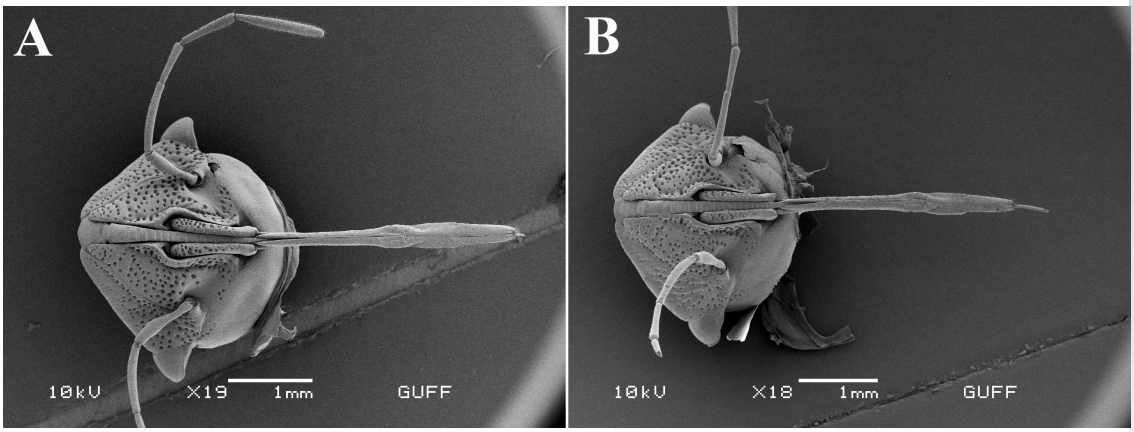


Figure 1. SEM micrographs of the head in *Eurygaster testudinaria.* A. Female individual; B. Male individual.

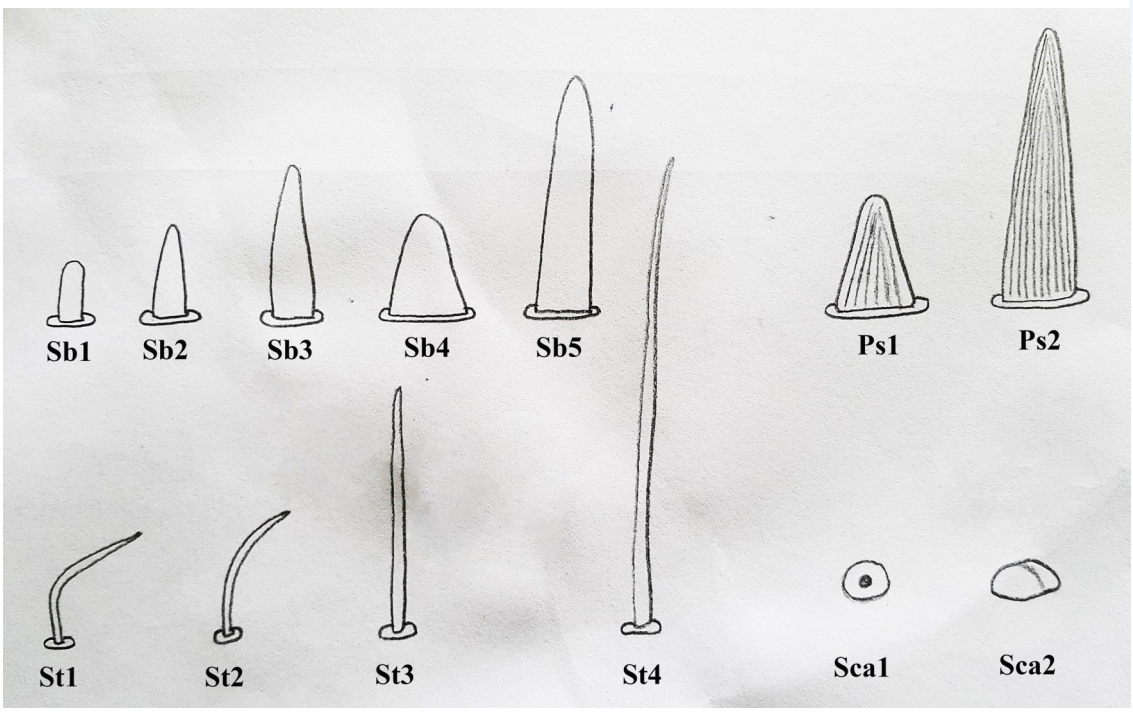


Figure 2. Diagrams of different types of sensilla on mouthparts, antenna, and head of *E. testudinaria.* Sb1, sensilla basiconica I; Sb2, sensilla basiconica II; Sb3, sensilla basiconica III; Sb4, sensilla basiconica IV; Sb5, sensilla basiconica V; Ps1, peg-like sensilla I; Ps2, peg-like sensilla II; St1, sensilla trichodea I; St2, sensilla trichodea II; St3, sensilla trichodea III; and St4, sensilla trichodea IV; Sca1, sensilla campaniformia I; Sca2, sensilla campaniformia II.

J.Het.Turk., 3(1), Mayv 2021 (eISSN 2687-3249)

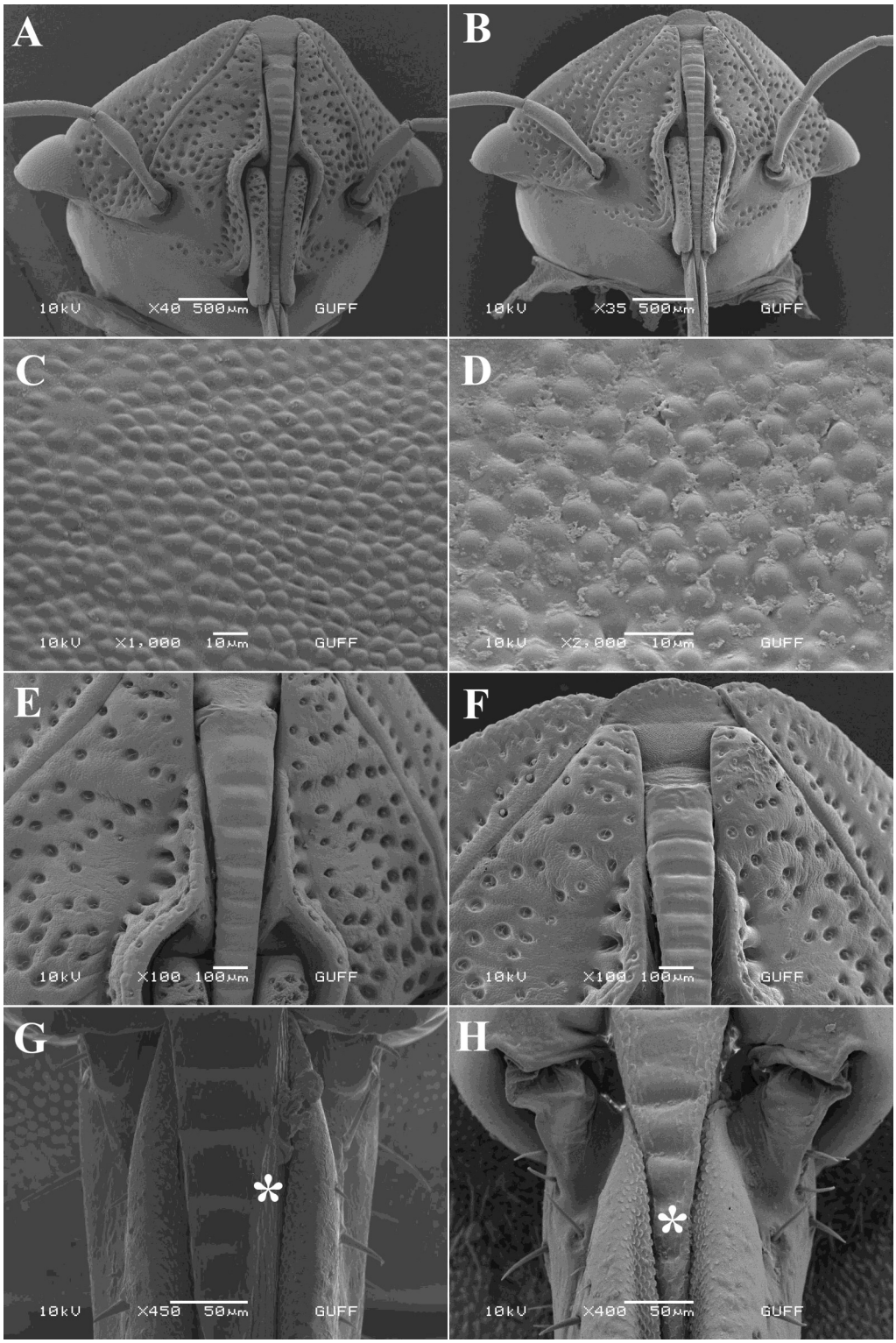


Figure 3. SEM micrographs of the head in *E. testudinaria;* A. Female individual; B. Male individual; C-D. Short dome-shaped protrusions on the surface of the proximal region; C. Female individual; D. Male individual; E-F. The surface of the other region of the labrum; E. Female individual; F. Male individual; G-H. Plate-shaped structures (*) at the end edges of the labrum; G. Female individual; H. Male individual.

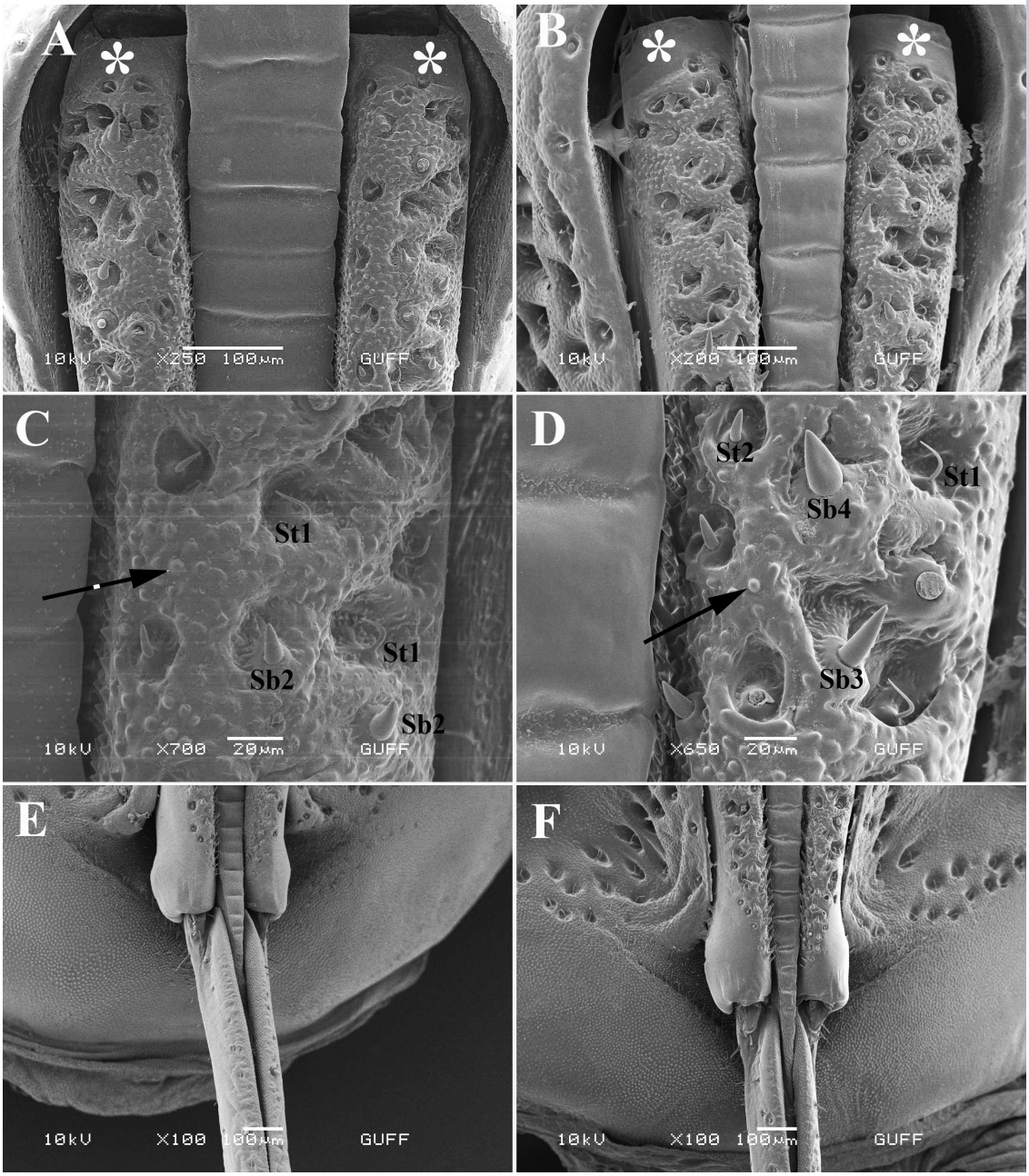


Figure 4. SEM micrographs of the first segment of labium in *E. testudinaria.* A. Female individual; B. Male individual; C. Different sized sensilla in the middle part of the labium in female; D. Different sized sensilla in the middle part of the labium in male; E. The last part of the first segment of the labium in female; F. The last part of the first segment of the labium in male. (*), the surface of the apex of the first segment; (→), small protrusions; St1, sensilla trichodea I; St2, sensilla trichodea II; Sb2, sensilla basiconica II; Sb3, sensilla basiconica III; Sb4, sensilla basiconica IV.

J.Het.Turk., 3(1), Mayv 2021 (eISSN 2687-3249)

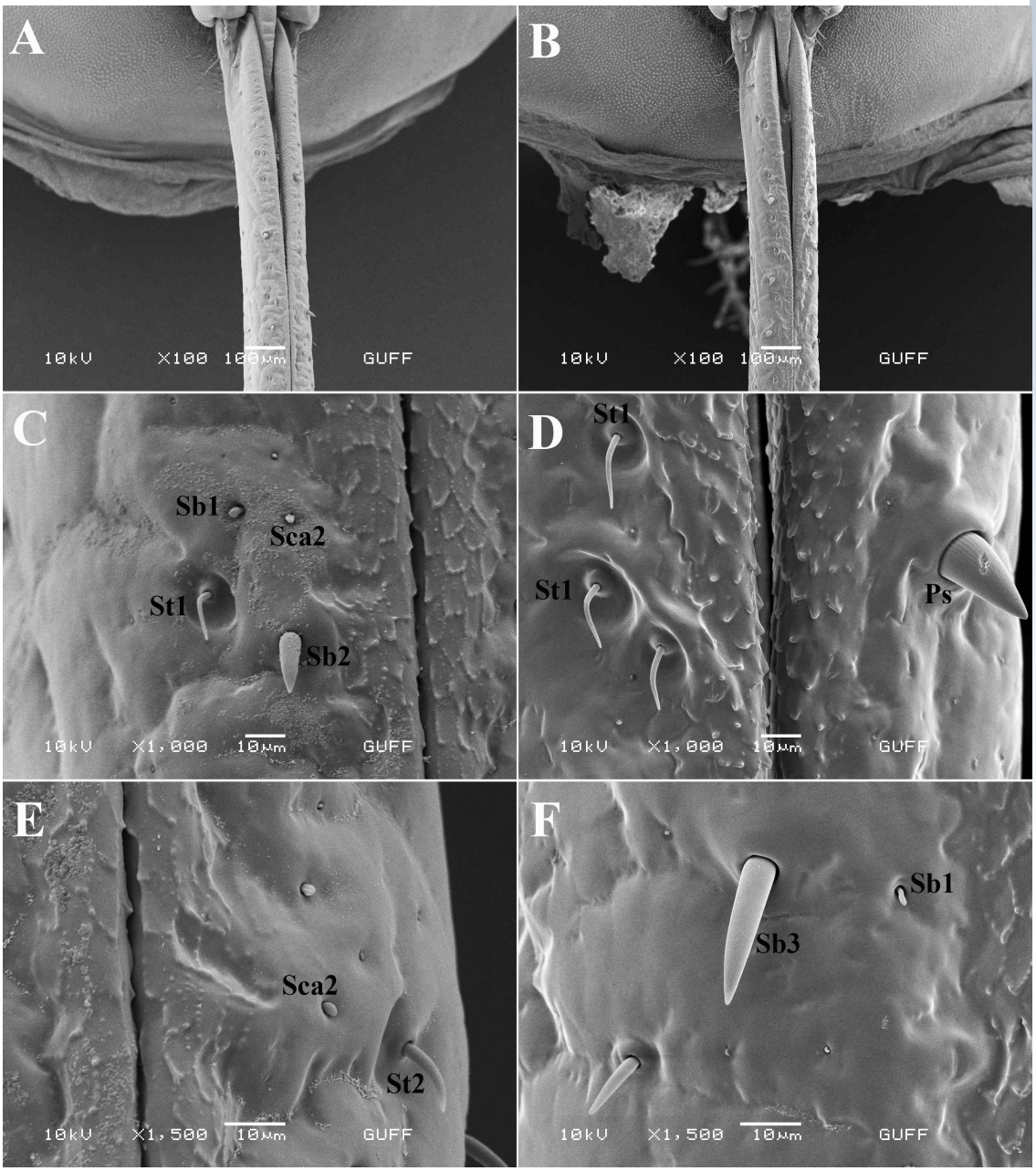


Figure 5. SEM micrographs of the second segment of labium in *E. testudinaria* A. Female individual; B. Male individual; C-F. SEM micrograph of four types of sensilla. C. and E. Female individual; D. and F. Male individual. Sb1, sensilla basiconica I; Sb2, sensilla basiconica II; Sb3, sensilla basiconica III; St1, sensilla trichodea I; St2, sensilla trichodea II; Sca2, sensilla campaniformia II; Ps1, peg-like sensilla I.

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

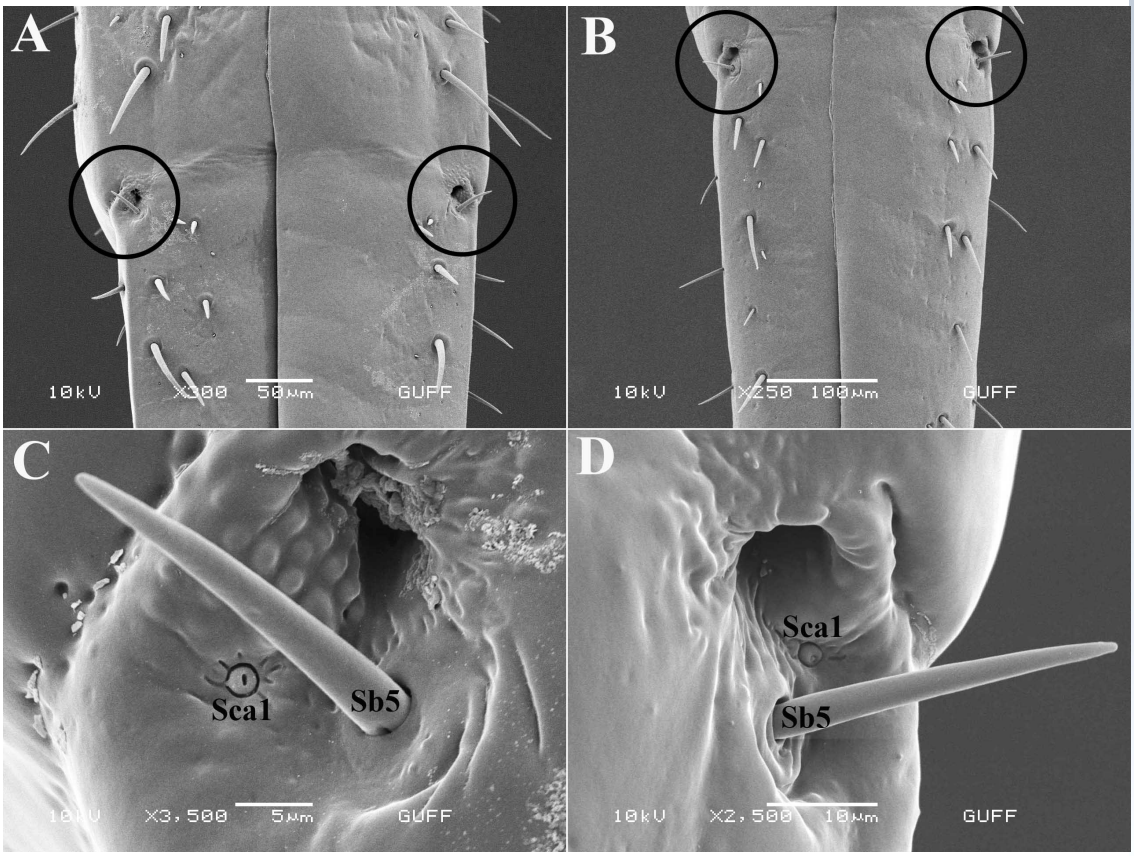


Figure 6. SEM micrographs of the junction of the second and third and the last segments in *E. testudinaria.* A. Female individual; B. Male individual; C-D. Sensilla campaniformia I (Sca1) and sensilla basiconica V (Sb5) type sensilla. C. Female individual; D. Male individual. (O), small canal structure.

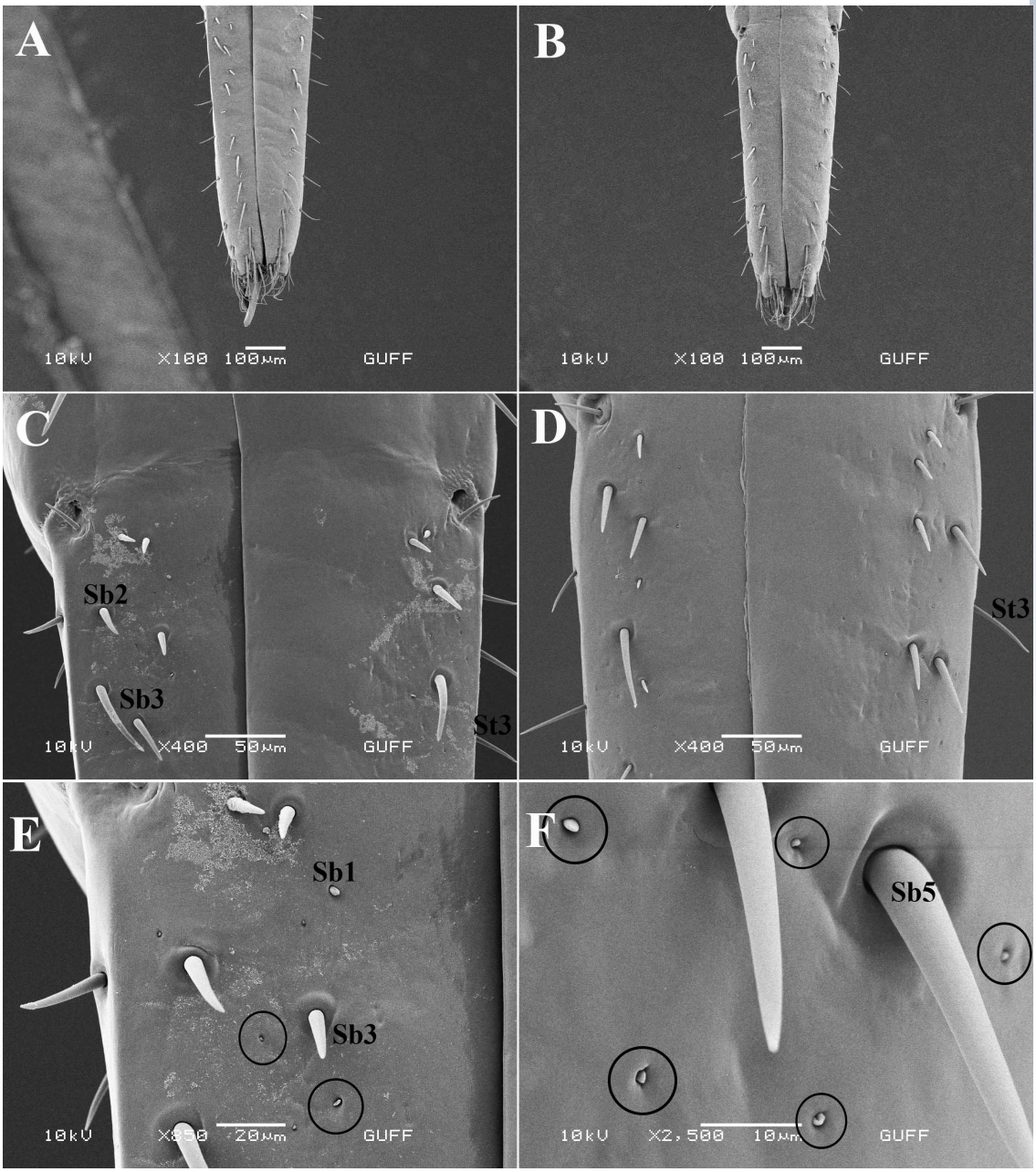


Figure 7. SEM micrographs of the third and the last segment in *E. testudinaria.* A. Female individual; B. Male individual; C-F. Sensilla basiconica (Sb), sensilla trichodea (St) and sensilla campaniformia (Sca) type sensila. C. and E. Female individual; D. and F. Male individual. Sb1, sensilla basiconica I; Sb2, sensilla basiconica II; Sb3, sensilla basiconica III; Sb5, sensilla basiconica V; St3, sensilla trichodea III; (O), Sca2, sensilla campaniformia II.

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

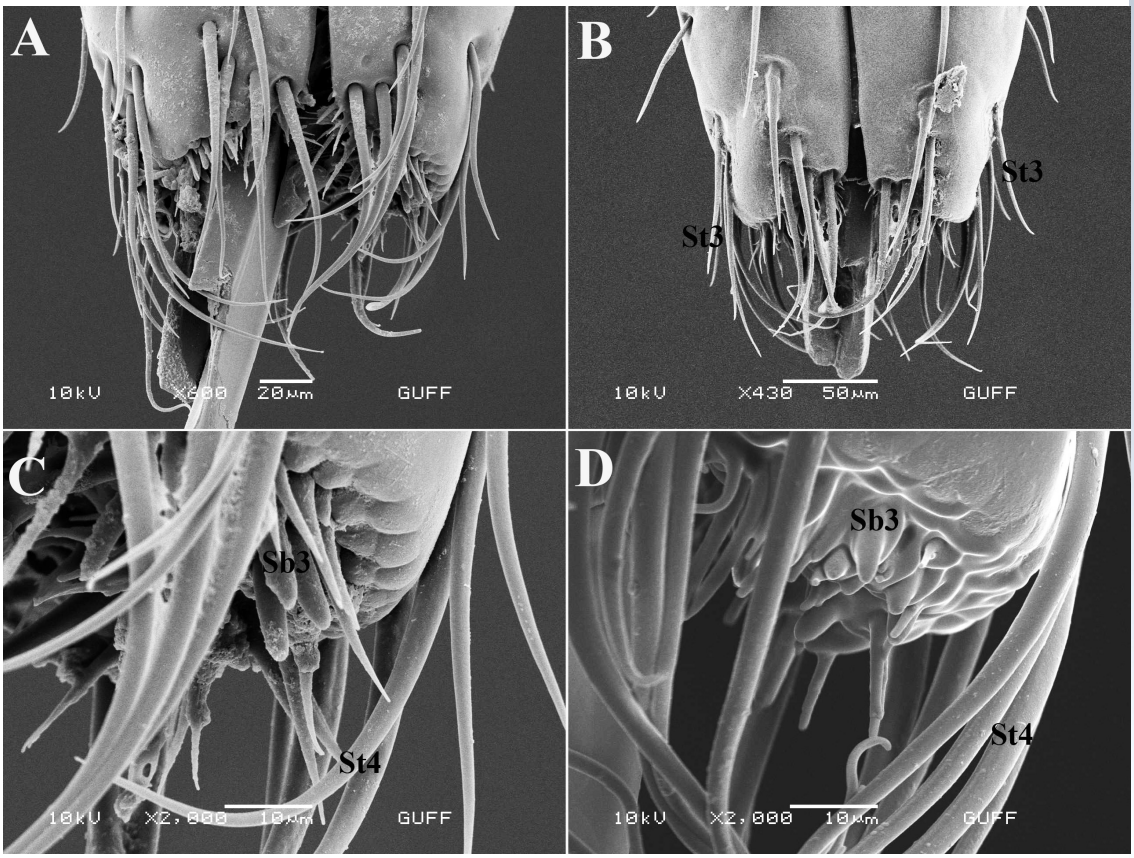


Figure 8. SEM micrographs of the last part of the third segment in *E. testudinaria*. A. Female individual; B. Male individual; C-D. Sensilla trichodea III (St3), sensilla trichodea IV (St4), and sensilla basiconica III (Sb3) type sensilla. C. Female individual; D. Male individual

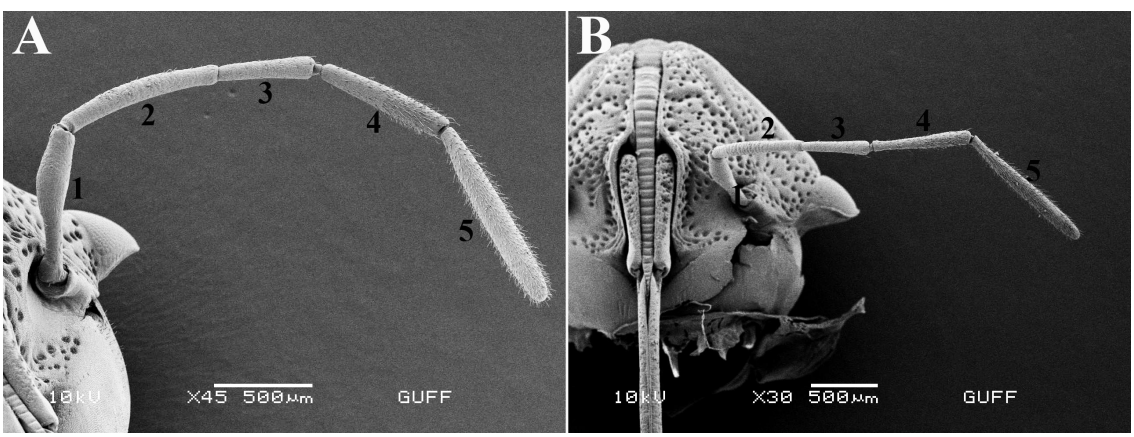


Figure 9. SEM micrographs of the antenna in *E. testudinaria*. A. Female individual; B. Male individual.

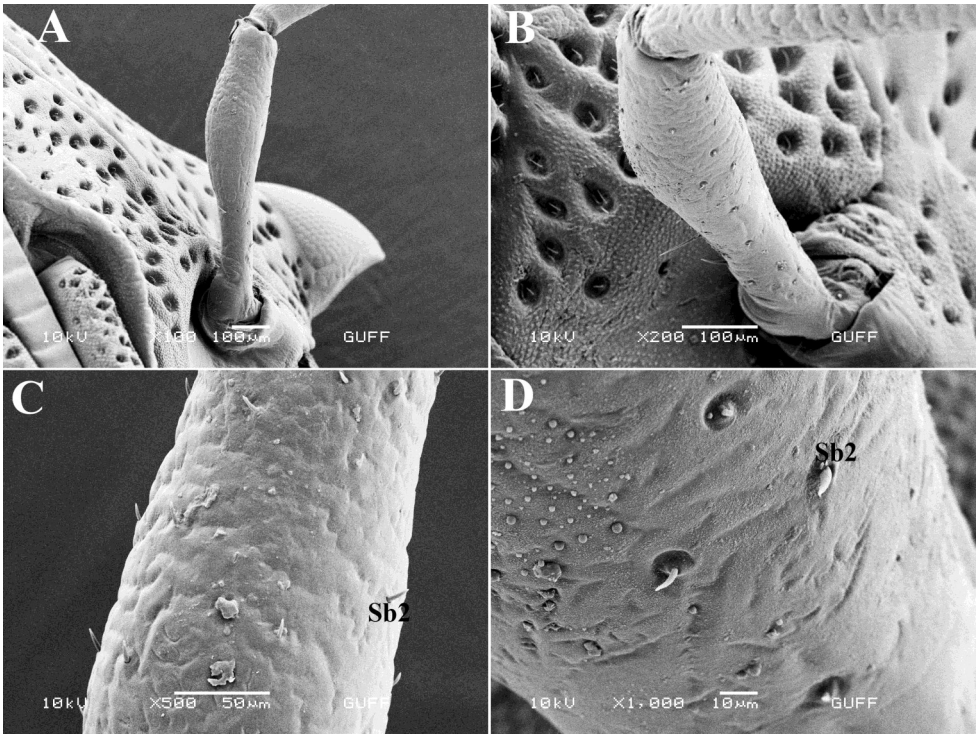


Figure 10. SEM micrographs of the first segment of the antenna. A. and C. Female individual; B. and D. Male individual. Sb2, sensilla basiconica II.

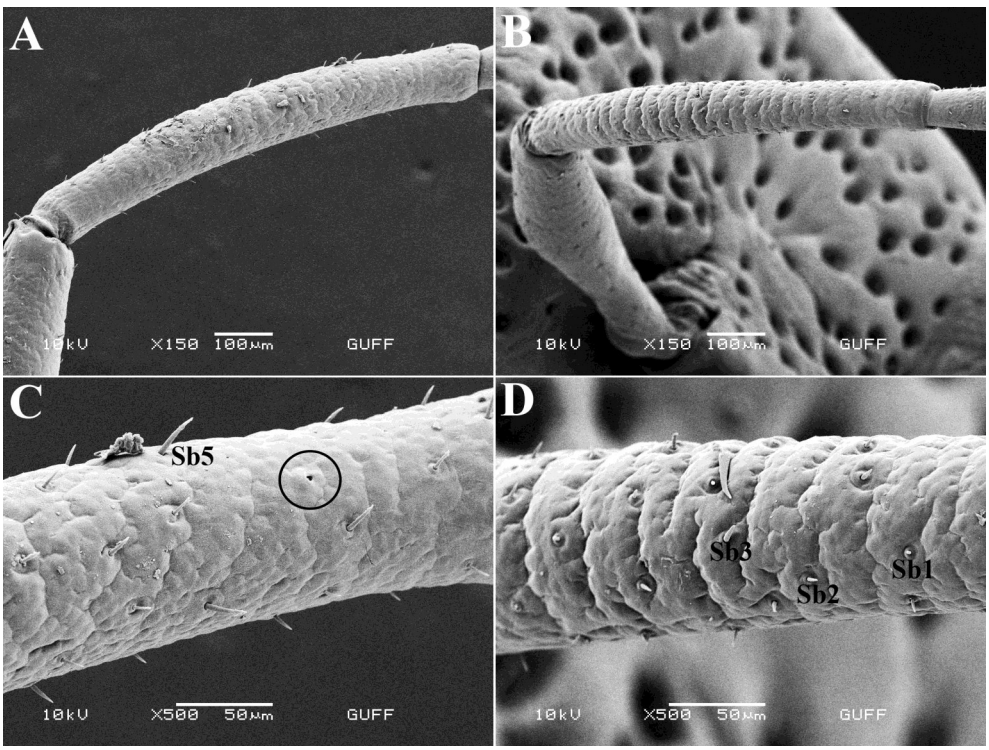


Figure 11. SEM micrographs of the second segment of the antenna. A. and C. Female individual; B. and D. Male individual. Sb1, sensilla basiconica I; Sb2, sensilla basiconica II; Sb3, sensilla basiconica III; Sb5, sensilla basiconica V; (O), Sca2, sensilla campaniformia II.

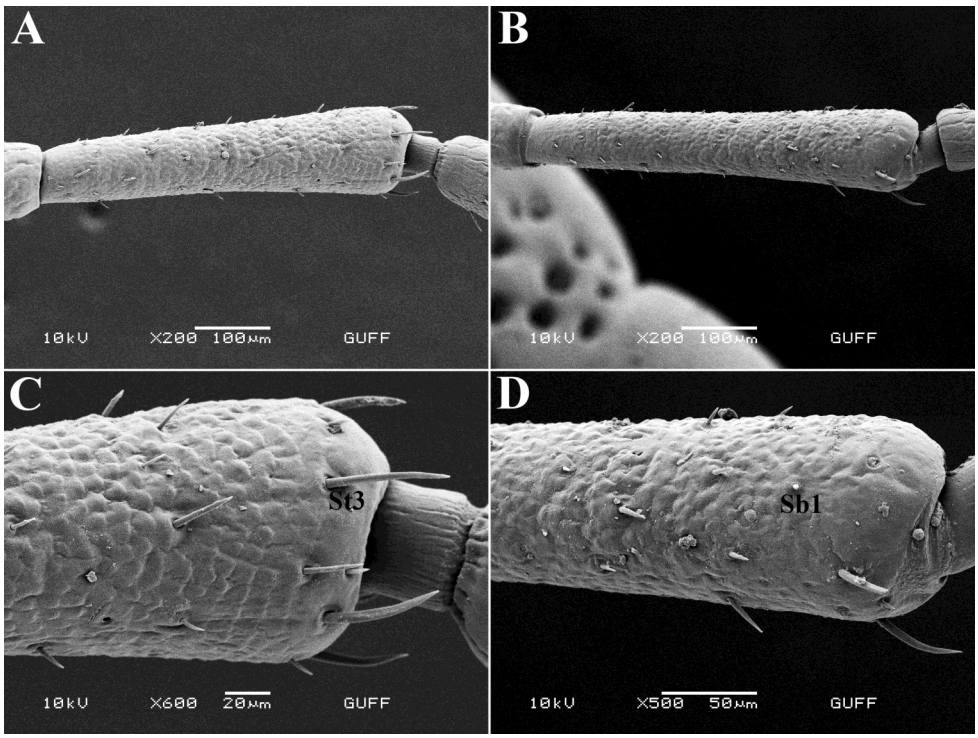


Figure 12. SEM micrographs of the third segment of the antenna. A. and C. Female individual; B. and D. Male individual. Sb1, sensilla basiconica I; St3, sensilla trichodea III.

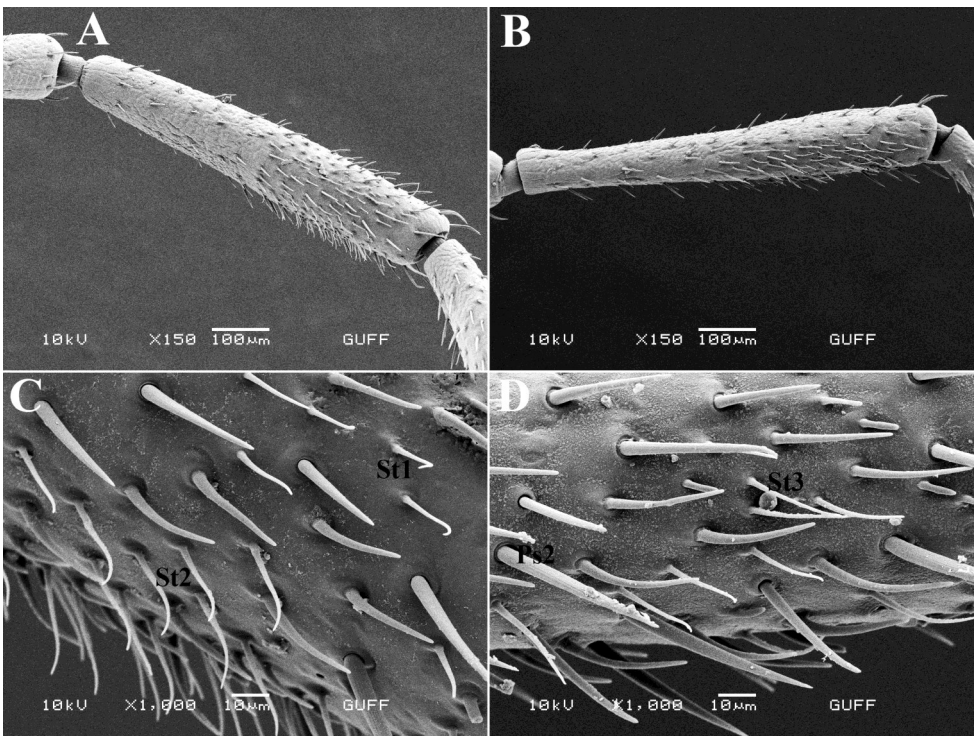


Figure 13. SEM micrographs of the fourth segment of the antenna. A. and C. Female individual; B. and D. Male individual. St1, sensilla trichodea I; St2, sensilla trichodea II; St3, sensilla trichodea III; Ps2, peg-like sensilla II.

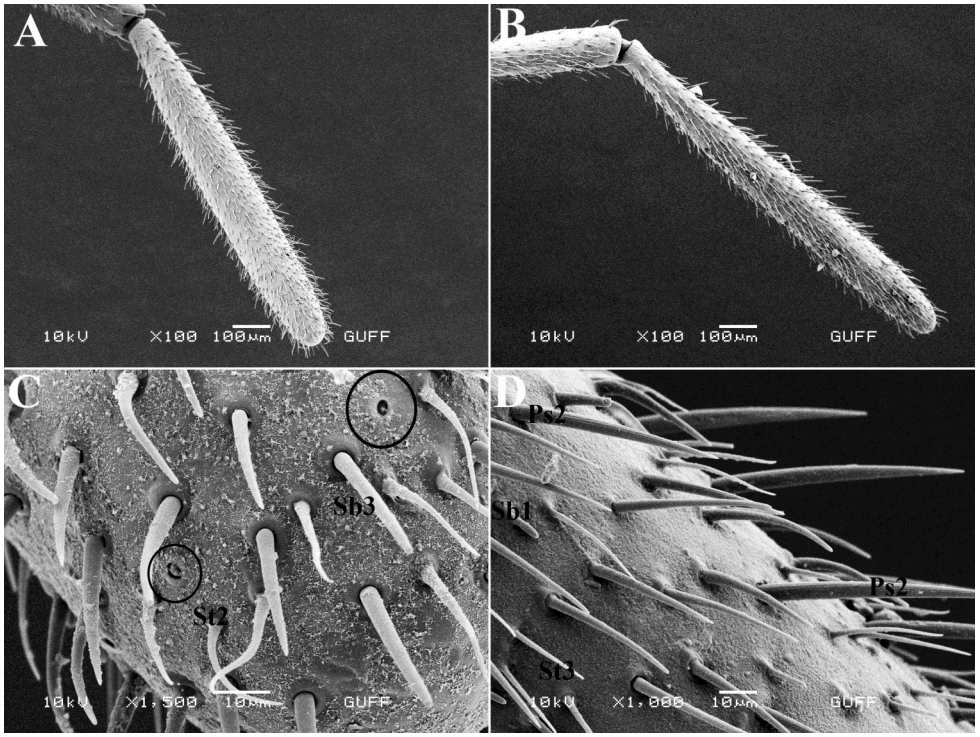


Figure 14. SEM micrographs of the fifth segment of the antenna. A. and C. Female individual; B. and D. Male individual. St2, sensilla trichodea II; St3, sensilla trichodea III; Sb1, sensilla basiconica I; Sb3, sensilla basiconica III; (O), Sca2, sensilla campaniformia II.

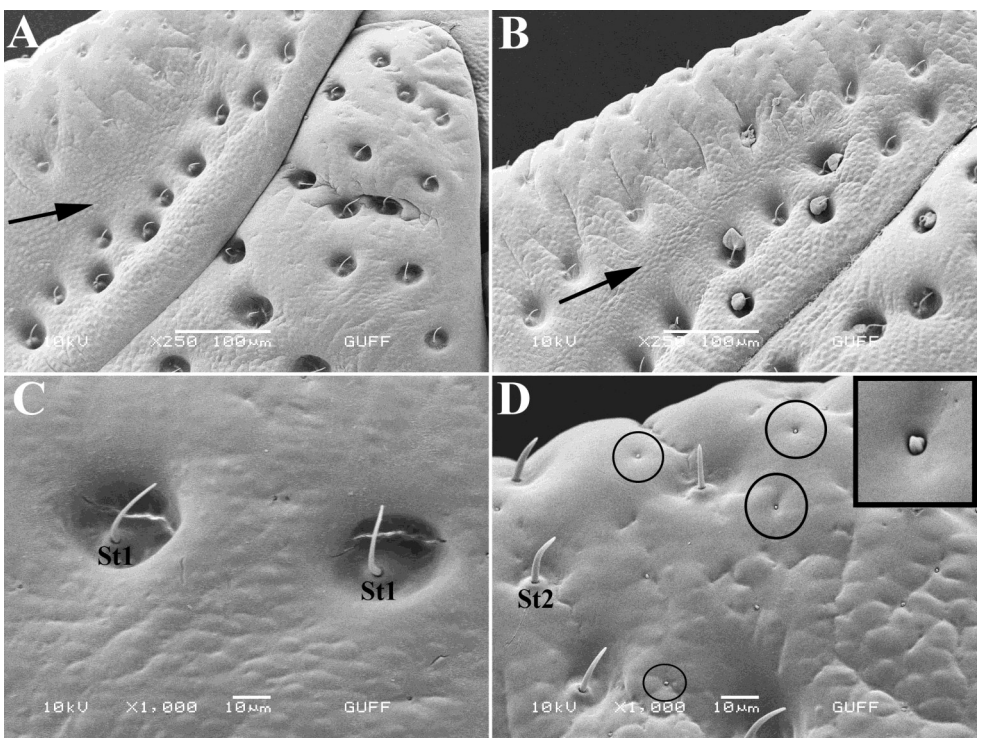


Figure 15. SEM micrographs of the surface of the head. A. and C. Female individual; B. and D. Male individual. (→), short dome-shaped protrusions on the surface; St1, sensilla trichodea I; St2, sensilla trichodea II; (O), Sca2, sensilla campaniformia II. The high magnification view of Sca2, sensilla campaniformia II (O) type sensilla is shown in the corner of Figure 5D. Its magnification is 5,000.

REFERENCES

Akent'eva, N. A., 2008, The formation of the antenna sensory apparatus in some bug (Heteroptera) species in the course of their postembryonic development. *Entomological Review*, 88(4): 381-390. https://doi.org/10.1134/S0013873808040015

Altner, H, Prillinger, L., 1980, Ultrastructure of invertebrate chemo- thermo- and hygroreceptors and its functional significance. *International Review of Cytology*, 67: 69-139. https://doi.org/10.1016/S0074-7696(08)62427-4

Ammar, E. D., Hall, D. G., 2012, New and simple methods for studying hemipteran stylets, bacteriomes, and salivary sheaths in host plants. *Annals of the Entomological Society of America*, 105(5), 731-739. https://doi.org/10.1603/AN12056

Backus, E. A., 1988, Sensory systems and behaviors which mediate hemipteran plant-feeding: A taxonomic overview. Journal of Insect Physiology, 34: 151-165. https://doi.org/10.1016/0022-1910(88)90045-5

Blaney, W. M., Chapman, R. F., 1969, The fine structure of the terminal sensilla on the maxillary palps of *Schistocerca gregaria* (Forskal) (Orthoptera, Acrididae). *Zeitschrift für Zellforschung und Mikroskopische Anatomie*, 99: 74-79. https://doi.org/10.1007/BF00338799

Brożek, J., Bourgoin, T., 2013, Morphology and distribution of the external labial sensilla in Fulgoromorpha (Insecta: Hemiptera). *Zoomorphology*, 132(1), 33-65. https://doi.org/10.1007/s00435-012-0174-z

Brozek, J., Chlond, D., 2010, Morphology, arrangement and classification of sensilla on the apical segment of labium in Peiratinae (Hemiptera: Heteroptera: Reduviidae). *Zootaxa*, 2476(1), 39-52.

Brożek, J., 2013, Comparative analysis and systematic mapping of the labial sensilla in the Nepomorpha (Heteroptera: Insecta). *The Scientific World Journal*, 1-44. https://doi.org/10.1155/2013/518034

Brożek, J., Zettel, H., 2014, A comparison of the external morphology and functions of labial tip sensilla in semiaquatic bugs (Hemiptera: Heteroptera: Gerromorpha). *European Journal of Entomology*, 111(2): 275-297. http://hdl.handle.net/20.500.12128/9062

Cao, Y. K., Huang, M., 2016, A SEM study of the antenna and mouthparts of *Omosita colon* (Linnaeus) (Coleoptera: Nitidulidae). *Microscopy Research and Technique*, 79(12): 1152-1164. https://doi.org/10.1002/jemt.22770

Carey, A. F., Carlson, J. R., 2011, Insect olfaction from model systems to disease control. *Proceedings of the National Academy of Sciences*, 108(32): 12987-12995. https://doi.org/10.1073/pnas.1103472108

Chapman, R. F., 1998, *Mechanoreception. Chemoreception*, In: Chapman R. F. (Ed.). The Insects, Structure and Function. Cambridge University Press, UK, 610-652 pp.

Faucheux, M. J., Németh, T., Kundrata, R., 2020, Comparative antennal morphology of agriotes (Coleoptera: Elateridae), with special reference to the typology and possible functions of sensilla. *Insects*, 11(2): 137. https://doi.org/10.3390/insects11020137

Fernandes, F. D. F., Bahia-Nascimento, A. C., Pinto, L. C., Leal, C. D. S., Secundino, N. F. C., Pimenta, P. F. P., 2008, Fine structure and distribution pattern of antennal sensilla of *Lutzomyia longipalpis* (Diptera: Psychodidae) sand flies. *Journal of Medical Entomology*, 45 (6): 982-990. https://doi.org/10.1093/jmedent/45.6.982

Freitas, S. P. C., Santos, L. C., de Souza, A. C., Junqueira, A. C. V., 2020, Morphological aspects of antennal sensilla of the *Rhodnius brethesi* Matta, 1919 (Hemiptera: Reduviidae) from the Negro river, Amazon region of Brazil. *Journal of Parasitology Research*, 1-6. https://doi.org/10.1155/2020/7687041

Fu, B. X., Bellis, G. A., Hong, J., Wang, J. R., Wu, Q., Tang, Q. Y., Cheng, J. A., Zhu, Z. R., 2012, Morphology, distribution, and abundance of antennal sensilla of male and female macropterous and brachypterous small brown planthopper, *Laodelphax striatellus* (Fallén) (Hemiptera: Delphacidae). *Microscopy Research and Technique*, 75 (11): 1492-1512. https://doi.org/10.1002/jemt.22093

Gullan, P. J., Cranston, P. S., 2014, The Insects: An Outline of Entomology, 5th ed., Wiley Blackwell: Oxford, UK, 95-124 pp.

Hallberg, E., Hansson, B. S., 1999, Arthropod sensilla: morphology and phylogenetic consideration. *Microscopy Research and Technique*, 47: 428-439. https://doi.org/10.1002/(SICI)1097-0029(19991215)47:6<428::AID-JEMT6>3.0.CO;2-P

Hao, Y., Dietrich, C. H., Dai, W., 2016, Structure and sensilla of the mouthparts of the spotted lanternfly *Lycorma delicatula* (Hemiptera: Fulgoromorpha: Fulgoridae), a polyphagous invasive planthopper. *PloS one*, 11(6): e0156640. https://doi.org/10.1371/journal.pone.0156640

Isidoro, N., Romani, R., Bin, F., 2001, Antennal multiporous sensilla: their gustatory features for host recognition in female parasitic wasps (Insecta, Hymenoptera: Platygastroidea). *Microscopy Research and Technique*, 55 (5): 350-358. https://doi.org/10.1002/jemt.1183

Kanturski, M., Akbar, S. A., Favret, C., 2017, Morphology and sensilla of the enigmatic Bhutan pine aphid *Pseudessigella brachychaeta* Hille Ris Lambers (Hemiptera: Aphididae)-A SEM study. *Zoologischer Anzeiger*, 266: 1-13. https://doi.org/10.1016/j.jcz.2016.10.007

Kaplin, V. G., Burlaka, G. A., 2019, Phenotypic variability of body coloration in the populations of scutellerid bugs (*Eurygaster* Laporte; Heteroptera, Scutelleridae) in cereal crops and the ecological factors responsible for it. *Entomological Review*, 99(8): 1099-1112. https://doi.org/10.1134/S0013873819080049

Li, S., Zhang, W., Wang, X., Lei, C., Zhu, F., 2016, Ultrastructure of sensilla on larvae and adults of *Chrysomya megacephala* (Diptera: Calliphoridae). *Entomological News*, 126(1): 52-63. https://doi.org/10.3157/021.126.0107

Li, Y., Liu, F., Du, X., Li, Z., Wu, J., 2018, Ultrastructure of antennal sensilla of three fruit borers (Lepidoptera: Crambidae or Tortricidae). *PloS one*, 13 (10): 1-10. https://doi.org/10.1371/journal.pone.0205604

Liang, X. M., Zhang, C. N., Li, Z. L., Xu, L. F., Dai, W., 2013, Fine structure and sensory apparatus of the mouthparts of the pear psyllid, *Cacopsylla chinensis* (Hemiptera: Psyllidae). *Arthropod Structure & Development*, 42: 495-506. https://doi.org/10.1016/j.asd.2013.08.002

Linnavuori, R. E., 2008, Studies on the Acanthosomatidae, Scutelleridae and Pentatomidae (Heteroptera) of Gilan and the adjacent provinces in northern Iran. *Acta Entomologica Musei Nationalis Pragae*, 48(1): 1-21.

Nowińska, A., Brożek, J., 2017, Morphological study of the antennal sensilla in Gerromorpha (Insecta: Hemiptera: Heteroptera). *Zoomorphology*, 136: 327-347. https://doi.org/10.1007/s00435-017-0354-y

Parveen, S., Ahmad, A., Brożek, J., Ramamurthy, V. V., 2015, Morphological diversity of the labial sensilla of phytophagous and predatory Pentatomidae (Hemiptera: Heteroptera), with reference to their possible functions. *Zootaxa*, 4039(2): 359-372. http://dx.doi.org/10.11646/zootaxa.4039.2.9

Shields, V. D. C., 2010, High resolution ultrastructural investigation of insect sensory organs using field emission scanning electron microscopy. Microscopy: science, technology, applications and education. *Formatex Badajoz*, 321-328.

Slifer, E. H., 1970. The structure of arthropod chemoreceptors. *Annual Review of Entomology*, 15: 121-141.

Syromyatnikov, M. Y., Golub, V. B., Kokina, A. V., Soboleva, V. A., Popov, V. N., 2017, DNA barcoding and morphological analysis for rapid identification of most economically important crop-infesting Sunn pests belonging to *Eurygaster* Laporte, 1833 (Hemiptera, Scutelleridae). *ZooKeys*, 706: 51-71. doi: 10.3897/zookeys.706.13888

Taszakowski, A., Nowińska, A., Brożek, J., 2019, Morphological study of the labial sensilla in Nabidae (Hemiptera: Heteroptera: Cimicomorpha). *Zoomorphology*, 138(4): 483-492.

https://doi.org/10.1007/s00435-019-00455-3

Wang, Y., Brożek, J., Dai, W., 2020, Morphological disparity of the mouthparts in polyphagous species of Largidae (Heteroptera: Pentatomomorpha: Pyrrhocoroidea) reveals feeding specialization. *Insects*, 11(3): 145. https://doi.org/10.3390/insects11030145

Wang, Y., Li, L., Dai, W., 2019, Fine morphology of the mouthparts in *Cheilocapsus nigrescens* (Hemiptera: Heteroptera: Miridae) reflects adaptation for phytophagous habits. *Insects*, 10 (5): 143. https://doi.org/10.3390/insects10050143

Wheeler, A. G., 2001, Biology of the Plant Bugs (Hemiptera: Miridae): Pests, Predators, Opportunists, Cornell University Press, Ithaca, NY, USA.

Zhang, Y. J., Chen, D. Y., Chao, X. T., Dong, Z. S., Huang, Z. Y., Zheng, X. L., Lu, W., 2021, Ultrastructure of antennal sensilla of *Copidosomopsis nacoleiae* (Eady) (Hymenoptera: Chalcidoidea: Encyrtidae), a parasitoid of *Diaphania angustalis* (Snellen) (Lepidoptera: Crambidae). *Microscopy Research and Technique*. DOI: 10.1002/jemt.23770

JHT
J.Het.Turk.
Journal of the Heteroptera of Turkey
ISSN 2687 - 3249 (online edition)
May, 2021
Volume 3, Issue 1

Research Article

First Record in Southeastern Anatolia of *Zelus (Diplodacus) renardii* (Kolenati, 1856) (Hemiptera: Reduviidae) and his New Prey *Allantus* (*s.str.*) *viennensis* (Schrank, 1781) (Hymenoptera: Tenthredinidae: Allantinae)

Hakan ÇELİK[1] Paride DIOLI[2] Halil BOLU[1]

[1]Dicle University, Faculty of Agriculture, Department of Plant Protection, TR 21280, Diyarbakır, TURKEY
E-mail: 144061018a@gmail.com, ORCID ID: 0000-0002-2318-3474(HÇ),
E-mail: besni@dicle.edu.tr, ORCID ID: 0000-0001-5488-0056 (HB)

[2]Natural History Museum, Department of Entomology, Milano-ITALY
E-mail: paridedioli@virgilio.it ORCID ID: 0000-0002-4274-0926

ABSTRACT: The present study was carried out in Diyarbakır (Kayapınar district) province in Southeastern Anatolia Region of Turkey in 2020. Reduviidae adults and larvae Tenthredinidae family was collected on *Rose* spp in Diyarbakır province of Turkey in November and brought to the laboratory for rearing. The larvae were reared at the temperature of 26±1°C, relative humidity of 65±5, and illumination of 3500 lux for 16 hours per day. As a result of this study, *Allantus* (*s.str.*) *viennensis* belonging to Tenthredinidae family and *Zelus (Diplodacus) renardii* belonging to Reduviidae family were obtained. It was determined for the first time that *Z. renardii*, a polyphagous predator, fed on *A. viennensis*. In addition, *Z. renardii* is the first record for Diyarbakır insect fauna.

KEYWORDS: *Zelus (Diplodacus) renardii,* new host record, *Allantus* (*s.str.*) *viennensis*, Turkey.

To cite this article: Çelik, H., Dioli, P., Bolu, H., 2021, First Record in Southeastern Anatolia of *Zelus (Diplodacus) renardii* (Kolenati, 1856) (Hemiptera: Reduviidae) and his New Prey *Allantus* (*s.str.*) *viennensis* (Schrank, 1781) (Hymenoptera: Tenthredinidae: Allantinae), *J.Het.Turk.*, 3 (1):31-39
DOI:10.5281/zenodo.4823762
To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A4.pdf
Received: Feb 6, 2021; **Revised:** Apr 13, 2021; **Accepted:** Apr 14, 2021; **Published online:** May 31, 2021

INTRODUCTION

Heteroptera (Hemiptera), or true bugs, is the most diverse group of paurometabolous insects with incomplete metamorphosis. There are about 40,000 described species worldwide and many more await description (Schuh & Slater, 1995).

The recent Catalogue of the Heteroptera of the Palaearctic Region lists approximately 3000 species for Europe (Aukema & Rieger, 1995-2006). Heteroptera have sucking mouthparts and feed-depending on the species-as parasites, predators, or herbivores on different food sources, from blood or

haemolymph to plant sap or the cytoplasma of fungi. Heteroptera -unique among insects- colonize almost the entire planet, including the surface of the ocean and Antarctica (Schuh & Slater, 1995).

Heteroptera includes 9365 species belonging to 1632 genera in Palaearctic Region (Aukema et al., 2013).

The endemic and largest genus *Zelus* Fabricius, 1803 of the New World belongs to the tribe Harpactorini (Reduviidae: Harpactorinae) and is widely distributed from Nearctic and Neotropic Regions.

The genus *Zelus* is represented by 71 species on the New World (Maldonado Capriles, 1990; Zhang et al., 2016). Between these species, *Zelus renardii* (Kolenati) and *Z. tetracanthus* Stål have an high potential for dispersal, expansion and adaptation in various areas of the World with climate similar to that of the areas of origin (Weirauch et al., 2012).

Zelus renardii, in particular, is considered an "alien species" in Europe and Asia where arrived after the beginning of the present Century.

This assassin bug is native in North and Central America and introduced into Hawaii, Midway Atoll, Philippines, Samoa (Weirauch et al., 2012) and Chile (Faúndez, 2015). It has recently arrived, probably by passive transport, also in Europe and the Middle East, in particular, in Albania, Crete, European Turkey, France, Greece, Italy, Sardinia, Portugal, Spain, Asian Turkey and Israel (Davranoglou, 2011; Petrakis & Moulet, 2011; Vivas, 2012; Dioli, 2013; Aukema et al., 2013; Çerçi & Koçak, 2016; van der Heyden, 2015, 2017, 2018; Pinzari et al., 2018; Garrouste, 2019; Dursun & Fent, 2020; Kıyak, 2020; van der Heyden & Grosso-Silva, 2020; Rattu & Dioli, 2020).

The causes of the dispersal of *Zelus renardii* to non-native areas (Hawaii, Chile, Asia and Europe) from the New World are unknown; it is also not clear whether the Greek, Italian and Spanish populations followed independent invasions or were based on a single introduction into Europe (Weirauch et. al., 2012). According to these authors. it is more likely that the populations established in the tropical areas of the Pacific may have originated from Central America, while the Chilean and European populations could derive from merchant transport and consequent adaptations to the Mediterranean and Middle Eastern climate, very similar to that of California (Weirauch et al., 2012; Pinzari et al., 2018).

Distribution in Turkey: *Z. renardii* was previously found in İstanbul and İzmir (Çerçi & Koçak, 2016), Ankara province (Kıyak, 2020) and Black Sea Region (Dursun & Fent, 2020). The present finding is new for Diyarbakır (Kayapınar district).

MATERIAL AND METHODS

Zoophag predator insect: *Zelus (Diplodacus) renardii* (Kolenati, 1856)

Material examined: 1♀, 2♂♂; 20.11.2020, Locality: Diyarbakır (Kayapınar district) (37°57.13'N, 40°10.36'E, at altitude of about 744 m), (Figures. 1-4).

The present study was carried out in Diyarbakır (Sur district) province in Southeastern Anatolia Region of Turkey in 2020. Reduviidae adults and larvae Tenthredinidae family were collected on *Rosa* spp in Diyarbakır province of Turkey in November 2020 and brought to the laboratory for rearing.

The larvae were reared at the temperature of 26±1°C, relative humidity of 65±5, and illumination of 3500 lux for 16 hours per day.

Zelus renardii identification was made by the second Author using the dichotomous keys of the genus *Zelus* (Zhang et al., 2016) and the direct comparison with the specimens of the entomological Collections of Milan Museum of Natural History (Italy). *Allantus viennensis* identification was made by Dr. Önder Çalmaşur (Atatürk University, Faculty of Agriculture, Department of Plant Protection, Erzurum,

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

Turkey).

Phytophag Host insect: *Allantus (Allantus) viennensis* (Schrank, 1781) (Hymenoptera: Tenthredinidae: Allantinae), (Fig. 5).

Material examined: Larvae number multiple samples 20.11.2020, Locality: Diyarbakır (Kayapınar district) (37°57.13'N, 40°10.36'E, at altitude of about 744 m).

Host plant: *Rosa* spp.

General Distribution: Native species in Europe: Austria, Belgium Croatia, Czech Republic, French mainland, Germany, Hungary, Italian mainland, Luxembourg, Romania, Sicily, Slovakia, Switzerland, The Netherlands (Fauna europaea, 2020), Records also in the Nearctic region (Fauna europaea, 2020), and Asia: Turkey (Çalmaşur & Özbek, 2003).

Distribution in Turkey: Erzincan: Avcılar, Erzurum: Dutçu, İspir, Çayırözü, Gümüşhane: Vauk Geçidi, Kars: Sarıkamış, Karakurt (Çalmaşur & Özbek, 2003). *Allantus (Allantus) viennensis* is the first record for Diyarbakır insect fauna. In addition, it was observed that the larval stage of this species feeds intensively on the leaves, buds and stems of the rose plant.

RESULTS

As a result of this study, *Allantus viennensis* belonging to Tenthredinidae family and *Zelus renardii* belonging to Reduviidae family were obtained. It was observed, for the first time, that *Zelus renardii*, a general hunter, fed on *A. viennensis*.

In addition, this prey is the first record for Diyarbakır insect fauna.

This fact, related to a generalist predator like *Z. renardii*, presupposes that it can also attack larvae of other species of Tenthredinidae like a wide range of insects, such Lepidoptera eggs and larvae (Noctuidae) including *Helicoverpa* spp., and Coleoptera (Coccinellidae and larvae; Curculionidae adults as *Anthonomus grandis* Boheman) (Dress & Jackman, 1999) and Homoptera as *Aphis gossypii* Glover (Hemiptera: Aphididae) (Kessing & Mau, 1991).

Attacks are recorded also on *Glycaspis brimblecombei* Moore (Hemiptera: Psyllidae (Garrison, 2001).

Also feeds on Geocoridae (Heteroptera) (Drees & Jackman, 1999), *Chrysoperla carnea* Stephen (Neuroptera: Chrysopidae) (Hodge,1999) and *Aphytis* spp. (Hymenoptera: Aphelinidae) (Heimpel et al., 1997).

DISCUSSION

By analogy with the cases mentioned above, the intense predatory action of *Z. renardii* on *Allantus viennensis*, cannot be emphasized without calculating the risks associated with the fact that *Z. renardii* is a randomly introduced alien insect.

In fact, people could think to use this species of assassin bug to combat this or other pests harmful to cultivated or forest plants.

Instead *Z. renardii* is a generalist predator which can also damage other predatory insects and auxiliary spiders such as "chrysopes" or "ladybirds" ("intra-guild predation"), as well illustrated by various researches (Cisneros & Rosenheim, 1997; Weirauch et al., 2012; Pinzari et al., 2018).

Furthermore, it is always advisable to be wary of alien species, accidentally introduced with the goods, because they can exert a strong competition with local assassin bugs. In this sense, the presence of sticky bristles on the anterior tibia, absent in European and Asian species, is eloquent. It could favor *Z. renardii* in the competition for food, thus interfering with the edaphic population dynamics of other assassin bugs (Pinzari et al., 2018).

Therefore, it is also important to control this alien predator population so that it does not constitute a dangerous disturbance of the ecosystem and human health, due to its painful stings.

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

Figure 1. *Zelus renardii* feeding on *Allantus viennensis* larvae

Figure 2. Female of *Zelus renardii* feeding on male specimen.

Figure 3. View of female specimens from dorsal and ventral parts

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

Figure 4. View of male specimens from dorsal and ventral parts

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

Figure 5. Damage of the larval stage of *Allantus viennensis* on the leafs

ACKNOWLEDGEMENTS

We are grateful to Prof. Dr. Önder Çalmaşur (Atatürk University, Faculty of Agriculture, Department of Plant Protection, Erzurum, Turkey) for identification of host insect and to Dr. Fabrizio Rigato (Curator of the Entomology Collections of Natural History Museum of Milan, Italy, NHMMI) for allowing examination of the material of the genus *Zelus* under his care.

REFERENCES

Aukema, B., Rieger, C. (eds), 1995-2006, *Catalogue of the Heteroptera of the Palaearctic Region.* Amsterdam; vol.1 (1995), 222 p.; vol. 2 (1996), 361 p.; vol. 3 (1999), 577 p.; vol. 4 (2001), 346 p.; vol. 5 (2006), 550 pp.

Aukema, B., Rieger, C., Rabitsch, W., 2013, Catalogue of the Heteroptera of the Palaearctic Region. Vol. 6. Supplement. Amsterdam, the Netherlands. *Netherlands Entomological Soc.*,629 pp.

Çalmaşur, Ö., Özbek, H., 2003, A Contribution to the Knowledge of Tenthredinidae (Symphyta, Hymenoptera) Fauna of Turkey Part II: Subfamilies Blennocampinae, Dolerinae, Nematinae and Selandrinae, *Turkish Journal of Zoology*, 28: 55-71.

Çerçi, B., Koçak, Ö., 2016, Contribution to the knowledge of Heteroptera (Hemiptera) fauna of Turkey. *Journal of Insect Biodiversity*, 4 (15): 1-18.

Cisneros, J.J., Rosenheim, J.A., 1997, Ontogenic change of prey preference in the generalist predator *Zelus renardii* and its influence on predator-predator interactions. *Ecological Entomology*, 22(4): 399–407.

Davranoglou, L.R., 2011, *Zelus renardii* (Kolenati, 1856), a New World reduviid discovered in Europe (Hemiptera: Reduviidae: Harpactorinae). *Entomologist's Monthly Magazine,* 147: 157- 162.

Dress, B. M., Jackman J., 1999, Field guide to Texas insects. Gulf Publ. Co., (Hemiptera: Reduviidae: Harpactorinae).

Entomologist's Monthly Magazine, 147: 157-162.

Dress, B. M., Jackman J., 1999, Field guide to Texas insects. Gulf Publ. Co., Houston, Texas. Rev. http://insects.tamu. edu/fieldguide/aimg51.html. (Access date: 05.04.2021).

Dursun, A., Fent, M., 2020, First Record of the Alien Species *Zelus renardii* (Kolenati, 1856) (Hemiptera: Heteroptera: Reduviidae) from Black Sea Region of Turkey. *J.Het.Turk.*, 2 (2): 144-147.

Dioli, P., 2013, *Zelus renardii* (Kolenati, 1856) (Insecta Heteroptera Reduviidae). *Quaderno di Studi e Notizie di Storia Naturale della Romagna*, 38 (133), 232–233.

Fauna Europaea, 2020, https://fauna-eu.org/ (Access date: 05.04.2021).

Faúndez, E., 2015, La chinche asesina *Zelus renardii* (Kolenati, 1856) (Heteroptera: Reduviidae) en Chile: Comentarios después de 15 años de su llegada al país. *Boletín de la Sociedad Entomológica Aragonesa (S.E.A.)*, 57, 421–423.

Garrison, R. W., 2001, Nuevas plagas de la agricultura en el sur de California. Psílido del eucalipto rojo, *Glycaspis brimblecombei*. Agricultural Commissioner of Weights & Measures, Los Angeles Co. in: http://acwm.co.la.ca.us/pdf/RedGUmLerppsyllidspan.pdf. (Access date: 05.04.2021).

Garrouste, R., 2019, *Zelus renardii* (Kolenati, 1856): une Réduve nouvelle pour la France (Hemiptera, Reduviidae, Harpactorinae). *Bulletin de la Société entomologique de France*, 124(3): 335-336.

Heimpel, G. E., Rosenheim E.A,, Mangel M., 1997, Predation on adult *Aphytis* parasitoids in the field. *Oecologia,* 110(3): 346-352.

Hodge, M. A., 1999, The implication of intraguild predation for the role of spiders in biological control. *J. Arachnology,* 27: 351-362.

Kessing, J. L. M. Mau R.E.L.. 1991, *Aphis gossypii* (Glover). Crp. Knowledge Master. Melon Aphid. in: http://www.extento.hawaii.edu/Kbase/crop/Typeaphis_g.htm. (Access date: 05.04.2021).

Kıyak, S., 2020, The new record invasive alien species (IAS) *Zelus renardii* (Kolenati, 1857) (Hemiptera: Heteroptera: Reduviidae) in Central Anatolia (Turkey). *J.Het.Turk., 2* (1): 47-52.

Maldonado Capriles, J., 1990, Systematic Catalogue of the Reduviidae of the World (Insecta: Heteroptera). *Caribbean Journal of Science,* Special edition, i-x, 1 -694.

Petrakis, P.V., Moulet, P., 2011, First record of the Nearctic *Zelus renardii* (Heteroptera, Reduviidae, Harpactorinae) in Europe. *Entomologia Hellenica,* 20: 75-81.

Pinzari, M., Cianferoni, F., Martellos, S., Dioli, P., 2018, *Zelus renardii* (Kolenati, 1856), a newly established alien species in Italy (Hemiptera: Reduviidae, Harpactorinae). *Fragmenta entomologica*, 50 (1): 31-35.

Rattu, A., Dioli, P., 2020, Prima segnalazione di *Zelus renardii* (Kolenati, 1856) in Sardegna (Hemipera, Reduviidae). *Revista gaditana de Entomología,* vol.XI (2020): 119-125.

Schuh, R.T., Slater, J.A., 1995, True Bugs of the World (Hemiptera: Heteroptera). Classification and Natural History. Cornell University Press, Ithaca, New York. xii + 336 pp.

Van der Heyden, T., 2015, Ein aktueller Nachweis von *Zelus renardii* (Kolenati, 1856) auf Kreta/Griechenland (Hemiptera: Heteroptera: Reduviidae: Harpactorinae). *Biodiversidad News*, 4 (52): 55-59.

Van der Heyden, T., 2017, First records of *Zelus renardii* (Kolenati, 1856) (Hemoptera: Heteroptera: Reduviidae: Harpactorinae) for Albania. *Arquivos Entomolóxicos,* 18: 49-50.

Van der Heyden, T., 2018, First record of *Zelus renardii* Kolenati (Heteroptera: Reduviidae: Harpactorinae) in Israel. *Revista Chilena de Entomología*, 44 (4): 463-465.

Van der Heyden, T., Grosso-Silva, J.M., 2020, First record of *Zelus renardii* Kolenati, 1856 in Portugal (Heteroptera: Reduviidae: Harpactorinae). *Arquivos Entomolóxicos*, 22: 347-349.

Vivas, L., 2012, Primera cita en España de la especie *Zelus renardii* (Kolenati, 1857) (Heteroptera: Reduviidae) que representa la segunda cita en Europa, *BV News*, 1: 34-40.

Weirauch, C., Alvarez, C., Zhang, G., 2012, *Zelus renardii* and *Z. tetracanthus* (Hemiptera: Reduviidae): biological attributes and the potential for dispersal in two assassin bug species. *Florida Entomologist*, 95 (3): 641–649.

Zhang, G., Hart, E., Weirauch, C., 2016, A taxonomic monograph of the assassin bug genus *Zelus* Fabricius (Hemiptera: Reduviidae): 71 species based on 10,000 specimens. *Biodiversity Data Journal*, 4: e8150. doi: 10.3897/BDJ.4.e8150.

JHT
J.Het.Turk.
Journal of the Heteroptera of Turkey
ISSN 2687 - 3249 (online edition)
May, 2021
Volume 3, Issue 1

Research Article

First Record of Sycamore Seed Bug *Belonochilus numenius* (Say, 1831) (Hemiptera: Heteroptera: Lygaeidae) in Turkey

Barış ÇERÇİ[1*] Tandoğan ORUZ[2]

[*1]Faculty of Medicine, Hacettepe University, Ankara, TURKEY

[2]Hürriyet Mahallesi, Güven Caddesi, 57/5, Tire/İzmir, TURKEY

[*]Corresponding author, E-mail: www.heteropteran99@gmail.com

ABSTRACT: Sycamore Seed Bug *Belonochilus numenius* (Say, 1831) is recorded from Izmir, for the first time in Turkey. This species is an invasive alien species in Europe and has been spreading there since its first record from France in 2008. In this paper, its current distribution in Europe and biology is summarized. Additionally, its habitus and that of similar species known from Turkey are illustrated.

KEYWORDS: *Belonochilus numenius* (Say, 1831), fist record, Heteroptera, Turkey.

To cite this article: Çerçi, B., Oruz, T., 2021, First Record of Sycamore Seed Bug *Belonochilus numenius* (Say, 1831) (Hemiptera: Heteroptera: Lygaeidae) in Turkey, *J.Het.Turk.*, 3 (1): 40-45
DOI:10.5281/zenodo.4839506
To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A5.pdf
Received: Jan 07, 2021; **Revised:** Feb 8, 2021; **Accepted:** Apr 30, 2021; **Published online:** May 31, 2021

INTRODUCTION

Belonochilus numenius (Say,1831), commonly referred to as Sycamore Seed Bug is a Nearctic species of the subfamily Orsillinae (Lygaeidae). It is one of the many alien Heteroptera species recently introduced to Europe (Rabitsch, 2008; Davranoglou, 2011; Petrakis & Moulet, 2011; Baena & Torres, 2012, Lupoli et al., 2020). Since its first record in Spain in 2008, it has spread throughout most of the European countries, except northern ones. *Belonochilus numenius* is a seed bug living and feeding on different *Platanus* trees (Wheeler, 1984; Matocq, 2008; Srebrova et al., 2019). A more detailed discussion on its distribution and biology is given below.

In recent years, many new alien Heteroptera species were recorded from Turkey, e.g. *Corythucha arcuata* (Say, 1831), *Corythucha ciliata* (Say, 1831), *Perillus bioculatus* (Fabricius, 1775), *Leptoglossus occidentalis* Heidemann, 1910, *Zelus renardii* (Kolenati, 1856), *Amphiareus obscuriceps* (Poppius, 1909), *Amphiareus constrictus* (Stål, 1860), *Halyomorpha halys* (Stål, 1855), *Campylomma miyamotoi* Yasunaga, 2001. Most of these alien species were first introduced in Europe and later

introduced to Turkey, most probably due to expansion of their distribution in Europe and subsequent arrival to Turkey (Mutun, 2003; 2009; Kıvan, 2004; Arslangündoğdu & Hızal, 2010, Fent & Kment, 2011; Çerçi & Koçak, 2016; 2017; Çerçi et al., 2019).

MATERIAL AND METHODS

The specimen of *Belonochilus numenius* examined in this paper was found in a sub-urban area, lying on the concrete pavement next to a building. More detailed information about collecting circumstances is given below. The habitus photographs were taken with a Nikon D3300 DSLR Camera combined with 68 mm extension tube and Lomo 3.7X microscope lens. The specimen examined is preserved in the private collection of the first author.

RESULTS

Belonochilus numenius (Say, 1831)

(Figure 1A)

Material examined: Turkey: İzmir, Selçuk, N 37°57'49.5" E 27°22'25.7", 25.11.2020, 1 female, T. Oruz leg., B. Çerçi det. & coll.

Comments: The collected specimen was first photographed and shared in the observation sharing platform iNaturalist (Oruz, 2020). It was found on the outside wall of a business store. The habitat around the building includes various palm, plane, fig, and olive trees, as well as orchards of peach. The surrounding suburban area has many orchards and gardens, rather than buildings. The most immediate tree to the specimen was a *Platanus* sp. The examination of the near trees did not offer any additional specimens.

This species was originally described from Pennsylvania, USA by Say (1831). It was later recorded from many states across United States, as well as Canada and Mexico in Northern America (Slater, 1964; Ashlock & Slater, 1988). Its discovery in Europe was first announced by Matocq (2008), from Corsica, France. However, the earliest specimen of this species in Europe was recorded by Gessé et al. (2009), a male collected in 11.08.2008, from Barcelona, Spain. After its initial findings in Europe, it was quickly recorded from many European countries. It is now known from Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, North Macedonia, Montenegro, Serbia, Slovakia, Slovenia, Spain and Switzerland (Matocq, 2008; Gessé et al., 2009; Küchler & Strauß, 2010; Rabitsch et al., 2011; Hradil, 2011; Torma, 2012; Werner et al., 2013; Kment et al., 2013; Kment & Cunev, 2013; Werner, 2014; Gogala et al., 2016; Protić & Šeat, 2016; Kulijer & Miljevic, 2016; Rabitsch, 2018; Davranoglou & Koutsoukos, 2018; Srebrova et al., 2019; Martinović et al., 2019; Martinović, 2020; Aukema, 2020). It should be noted that it has not yet been recorded from any northern and eastern European countries. This new record from İzmir constitutes the first record of this species both from Turkey and Asian continent.

Belonochilus numenius is essentially associated with *Platanus* spp., although its nymphs were also occasionally collected from *Ambrosia trifida*, *Celtis occidentalis* and *Salix* sp. (Froeschner, 1944; Wheeler, 1984). Its lifecycle on *Platanus* was documented in detail by Wheeler (1984) and summarized followingly: The species survives winter in the eggs which are inserted singly between nutlets of the fallen fruit of the tree. Nymphs feed on these fallen fruits until they become adult in late May. Around this time, first generation adult females lay eggs on the new season fruits that are attached to the tree. Second and third generation of nymphs can be observed in June and August, respectively.

Belonochilus numenius (Fig. 1A) is similar to several species of the subfamily Orsillinae Stål, 1872 that are already known from Turkey. Especially species of the genus *Orsillus* Dallas, 1852 can be easily confused with *B. numenius* in the first view because of similarly elongated head

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

and flat and slender body shape. Species of *Orsillus* that are known from Turkey are *Orsillus reyi* Puton, 1871 (Fig. 1B), *Orsillus maculatus* (Fieber, 1861) (Fig. 1C) and *Orsillus depressus* Dallas, 1852 (Fig. 1D) (Önder et al., 2006). Although these three species are in overall morphology and coloration similar to *B. numenius*, latter is distinguished from them easily by the single tooth of the forefemur. *Orsillus* species always have more than one tooth on forefemur (Péricart, 1998). Some other morphological features of *B. numenius* such as slenderer body, more or less transparent hemelytra, lack of marmorated pattern of the corium, stronger and longer keel along the midline of scutellum can be useful in identification but these features can show variability among different populations. *Orsillodes longirostris* Puton, 1884 (Fig. 1E), a very rare species belonging to subfamily Rhyparochrominae Amyot & Serville, 1843 that has only been recorded from Turkey twice (Çerçi & Tezcan, 2020), may also be confused with this species in the first glance due to its elongated head and flat body. But after a thorough look, one can appreciate many obvious distinguishing features, including totally black scutellum and partially black head and pronotum, distinct punctuation of hemelytra, wide abdomen and distinctly expanded forefemurs.

DISCUSSION

In recent years, many Heteroptera species have been recorded from Turkey for the first time. Among them, there are also several species which originally did not distribute in Western Palaearctic region but introduced here and established as invasive alien species. These species have the potential to pose a threat to native species and the ecosystem that they integrate into. They can also have a negative impact on the national economy if they damage economically important agricultural crops. Therefore, it is important to know the distribution of invasive alien species. With this regard, the first record of *Belonochilus numenius* from Turkey is important as it shows that this species continues to spread in the Western Palaearctic region. Although this first record is important to create an awareness for further research, field surveys should be done in the future to demonstrate the expansion of this invasive species in Turkey.

ACKNOWLEDGEMENT

We want to thank Özgür Koçak (Karaman, Turkey) for sharing the specimen of *Orsillus depressus* that was illustrated in this paper. We are also thankful to two anonymous referees who reviewed this article, for their valuable comments and remarks on the initial version of the manuscript.

REFERENCES

Arslangündoğdu, Z., Hızal, E., 2010, The Western Conifer Seed Bug, *Leptoglossus occidentalis* (Heidemann, 1910), recorded in Turkey (Heteroptera: Coreidae), *Zoology in the Middle East*, 50(1): 138–139. DOI: 10.1080/09397140.2010.10638426.

Ashlock, P. D. & Slater, A., 1988, *The seed bugs and chinch bugs. 167–245 pp.* In: *Catalog of the Heteroptera, or true bugs, of Canada and the continental United States* (*Eds. T. J. Henry, R. C. Froeschner*). E.J. Brill, Leiden, 958 pp.

Aukema, B., 2020, Catalogue of Palaearctic Heteroptera. Naturalis Biodiversity Center. Available from https://catpalhet.linnaeus.naturalis.nl/ (Accessed on 06-01-2021).

Baena, M., Torres, J. L., 2012, Nuevos datos sobre heterópteros exóticos en España y Francia: Tempyra biguttula STÅL, 1874, Belonochilus numenius (SAY, 1832) y Zelus renardii (KOLENATI, 1856) (Heteroptera: Rhyparochromidae, Orsillidae, Reduviidae), *Boletín de la Asociación española de Entomología*, 36 (3-4): 351-360.

Çerçi, B., Koçak, Ö., 2016, Contribution to the knowledge of Heteroptera (Hemiptera) fauna of Turkey, *Journal of*

Insect Biodiversity, 4(15): 1–18.

Çerçi, B., Koçak, Ö., 2017, Further contribution to the Heteroptera (Hemiptera) fauna of Turkey with a new synonymy. *Acta Biologica Turcica*, 30(4): 121–127.

Çerçi, B., Koçak, Ö., Tezcan, S., 2019, Two new species and ten new records of Heteroptera from Turkey, including the first record of the potential alien *Campylomma miyamotoi* in the Western Palaearctic, *Acta Entomologica Musei Nationalis Pragae*, 59(1): 295–306.

Çerçi, B., Tezcan, S., 2020, Contribution to the Lygaeoidea (Heteroptera) fauna of Turkey based on specimenspreserved in the Lodos Entomological Museum, Turkey (LEMT) and additional information. *Journal of Insect Biodiversity*, 15(1): 6–15.

Davranoglou, L.R., 2011, *Zelus renardii* (Kolenati, 1856), a new world reduviid discovered in Europe (Hemiptera: Reduviidae: Harpactorinae), *Entomologists Monthly Magazine*, 147(1766): 157.

Davranoglou L.R., Koutsoukos V., 2018, First record of the Nearctic sycamore seed bug *Belonochilus numenius* (Hemiptera: Heteroptera: Lygaeidae) from Greece, *Ecologica Montenegrina*, 16: 32–33.

Fent, M., Kment, P., 2011, First record of the invasive western conifer seed bug *Leptoglossus occidentalis* (Heteroptera: Coreidae) in Turkey, North-Western Journal of Zoology, 7(1): 72–80.

Froeschner, R.C., 1944, Contribution to a synopsis of Hemiptera of Missouri, Part 3, *The American Midland Naturalist*, 31 (3): 638–683.

Gessé, F., Ribes, J., Goula, M., 2009, *Belonochilus numenius*, the sycamore seed bug, new record for the Iberian fauna, *Bulletin of Insectology*, 62(1): 121–123.

Gogala, A., Kamin, J., Zdešar, M., 2016, Three new records of Heteroptera in Slovenia, *Acta Entomologica Slovenica*, 24 (1): 55–58.

Hradil, K., 2011, Faunistic Records from the Czech Republic – 315, Heteroptera: Lygaeidae, *Belonochilus numenius* (SAY, 1831), *Klapalekiana*, 47: 261–262.

Kıvan, M., 2004, Some observations on *Perillus bioculatus* (F.) (Heteroptera: Pentatomidae), a new record for the entomofauna of Turkey, *Turkish Journal of Entomology*, 28(2): 95–98.

Kment, P., Cunev, J., 2013, First record of the alien seed bug *Belonochilus numenius* (Hemiptera: Heteroptera: Lygaeidae) in Slovakia, *Entomofauna Carpathica*, 25 (2): 15–20.

Kment, P., Hradil, K., Baňař, P., Balvín, O., Cunev, J., Ditrich, T., Jindra, Z., Roháčová, M., Straka, M., Sychra, J., 2013, New and interesting records of true bugs (Hemiptera: Heteroptera) from the Czech Republic and Slovakia V, *Acta Musei Moraviae Scientiae Biologicae*, 98 (2): 495–541.

Kulijer, D., Miljevic, I., 2016, First report of *Belonochilus numenius* (Say, 1832) in Bosnia and Herzegovina (Heteroptera, Lygaeidae), *Folia Historico-Naturalia Musei Matraensis*, 40: 61–63.

Küchler, S., Strauß, G., 2010, *Belonochilus numenius* (Say, 1832) (Heteroptera: Lygaeidae)—bald auch in Mitteleuropa?, *Beiträge zur Entomofaunistik*, 11: 27–33.

Lupoli, R., van der Heyden, T., Dioli, P., 2020, *Erthesina* Spinola, 1837 – a new alien genus for Europe found in Albania (Hemiptera: Pentatomidae), *Heteroptera Poloniae - Acta Faunistica*, 14: 121–123. DOI: 10.5281/zenodo.3882222.

Martinović, M., Gjeldum, A., Koren, T., 2019, *Belonochilus numenius* (Say, 1832) (Heteroptera: Lygaeidae), a new invasive species in Croatia, *Natura Croatica: Periodicum Musei Historiae Naturalis Croatici*, 28(2): 481–484. DOI: 10.20302/NC.2019.28.34.

Martinović, M., 2020, First Record of *Belonochilus numenius* (Say, 1832) (Hemiptera: Heteroptera: Lygaeidae) From Montenegro, *Acta Entomologica Serbica*, 25(2): 97-99.

Matocq, A., 2008, Présence en France et en Corse d'un Hétéroptère nord-américain, *Belonochilus numenius* (Say, 1831) (Hemiptera, Lygaeidae, Orsillinae), *Bulletin de la Société entomologique de France*, 113(4): 533–534.

Mutun, S., 2003, First report of the oak lace bug, *Corythucha arcuata* (Say, 1832)

(Heteroptera: Tingidae) from Bolu, Turkey, *Israel Journal of Zoology*, 49(4): 323.

Mutun, S., 2009, *Corythucha ciliata*, a new *Platanus* pest in Turkey, *Phytoparasitica*, 37(1): 65–66.

Oruz, T. (2020). iNaturalist Research-grade Observations. https://www.inaturalist.org/observations/65575169. Occurence dataset: https://doi.org/10.15468/ab3s5x via GBIF.org on 06-01-2021.

Önder, F., Karsavuran, Y., Tezcan, S., Fent, M., 2006, *Heteroptera (Insecta) Catalogue of Turkey*. META Press, vi+164 pp., İzmir, Turkey.

Péricart, J., 1998, *Hémiptères Lygaeidae euro-méditerranéens, volume 2*, Faune de France. Vol. 84B, Fédération Française des Sociétés de Sciences Naturelles, 453 pp., Paris, France.

Protić, L., Šeat, J., 2016, First records of the alien sycamore seed bug *Belonochilus numenius* in Serbia (Heteroptera: Lygaeidae), *Acta Entomologica Serbica*, 21: 13–19.

Petrakis, P. V., Moulet, P., 2011, First record of the nearctic *Zelus renardii* (Heteroptera, Reduviidae, Harpactocorinae) in Europe. *Entomologia Hellenica*, 20(2): 75–81.

Rabitsch, W., 2008, Alien true bugs of Europe (Insecta: Hemiptera: Heteroptera), *Zootaxa*, 1827(1): 1–44.

Rabitsch, W., Bräu, M., Friess, T., 2011, *Belonochilus numenius* (Say, 1832) (Heteroptera: Lygaeidae) has reached Austria, *Beiträge zur Entomofaunistik*, 12: 148–149.

Rabitsch, W., 2018, Snapshot of the terrestrial true bug fauna of the Pocem floodplains (Insecta: Hemiptera: Heteroptera), *Acta ZooBot Austria*, 155: 251–256.

Say, T., 1831, *Descriptions of new species of Heteropterous Hemiptera of North America*. New Harmony Press, Indiana, December 1831. Reprint pp. 310-368: in Le Conte, J.L. (Ed.) (1859).

Slater, J. A., 1964, *A Catalogue of the Lygaeidae of the world, 2 vols*. University of Connecticut, Storrs, 1668 pp., Connecticut, USA.

Srebrova, K., Nacheski, S., Sotirovski, K., 2019, Widespread Distribution of the Sycamore Seed Bug *Belonochilus numenius* (Hemiptera: Heteroptera: Lygaeidae) Throughout the Republic of North Macedonia, *South-east European Forestry*, 10(2): 145–149. DOI: 10.15177/seefor.19-19

Torma, A. 2012, First record of the alien sycamore seed bug *Belonochilus numenius* (Heteroptera: Lygaeidae) in Hungary, *Növényvédelem*, 48 (10): 467–468.

Werner, D. J., Brandner, J., Muller, A., Zapf, M., 2013, Ein Fund von *Belonochilus numenius* (Say, 1831) in Deutschland (Heteroptera: Lygaeidae) mit Diskussion zum Jahr der Erstbeschreibung der Art, *Heteropteron*, 39: 37–39.

Werner, D., 2014, Die amerikanische Platanen-Samen-Wanze *Belonochilus numenius* (Say, 1831) (Heteroptera: Lygaeidae, Orsillinae) als Neozoon in Europa und in Deutschland: Verbreitung und Biologie, *Andrias*, 20: 245–250.

Wheeler, A.G. Jr., 1984, Seasonal History, Habits, and immature stages of *Belonochilus numenius* (Hemiptera: Lygaeidae). *Proceedings of The Entomological Society of Washington*, 86 (4): 790–796.

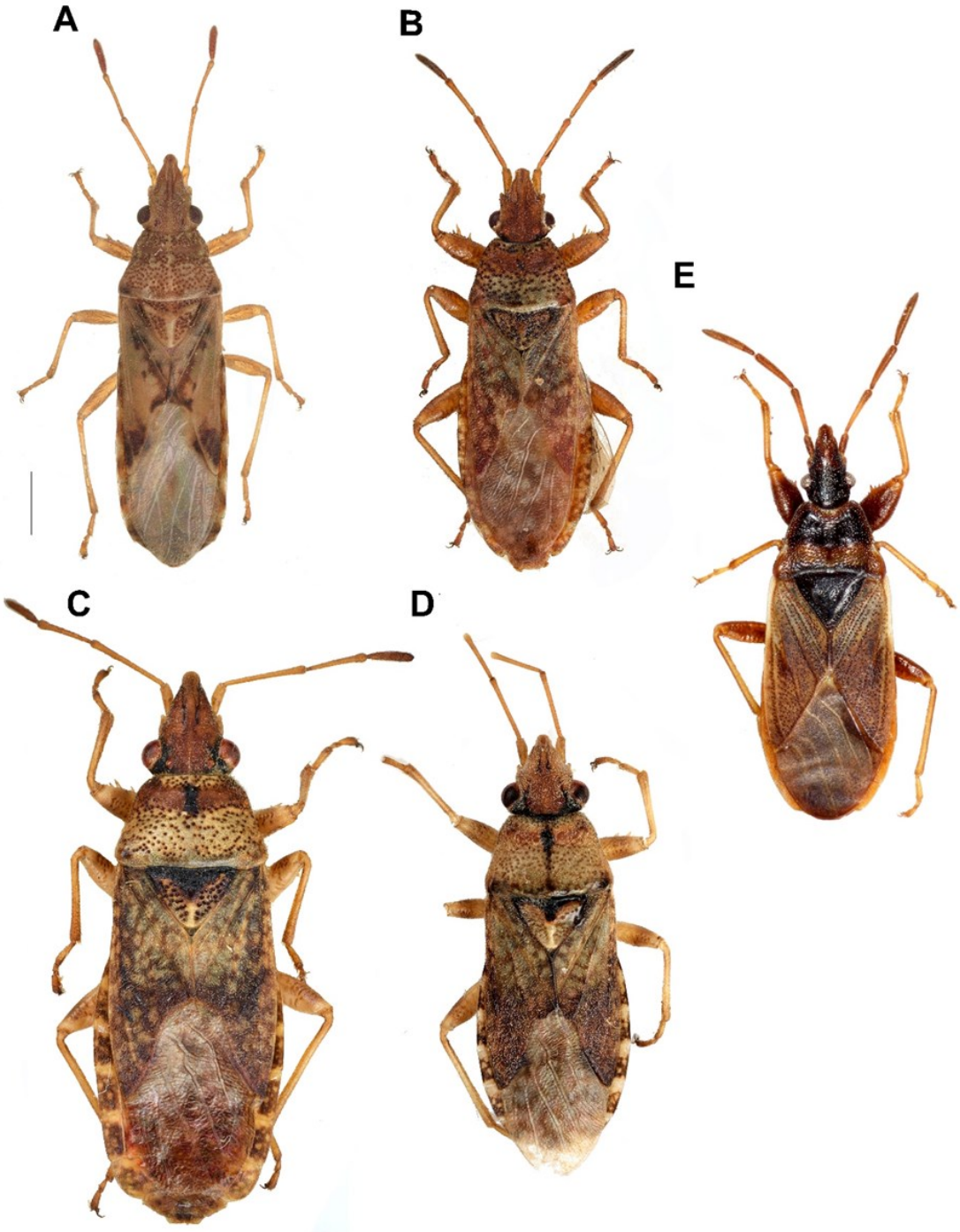


Figure 1A–E. A – *Belonochilus numenius* (Say, 1831), female from İzmir, **B** – *Orsillus reyi* Puton, 1871, male from İstanbul, **C** – *Orsillus maculatus* (Fieber, 1861), female from İzmir, **D** – *Orsillus depressus* Dallas, 1852, female from Karaman, **E** – *Orsillodes longirostris* Puton, 1884, female from Antalya. Scale bar = 1 mm.

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

JHT
J.Het.Turk.
Journal of the Heteroptera of Turkey
ISSN 2687 - 3249 (online edition)
May, 2021
Volume 3, Issue 1

Research Article

About Habitat Type Preferences of Some Coreoidea (Hemiptera: Heteroptera) Species of Yahyalı-Kayseri

Suat Kıyak[1] Ayşe Baş[2]

1)Gazi Universtiy, Faculty of Sciences, Department of Biology, 06500-Ankara, TURKEY
E-mail: skiyak@gazi.edu.tr ORCID iD: 0000-0001-8167-8283
2)Gazi University, Intitute of Sciences, Department of Biology, Teknikokullar-Ankara/TURKEY

ABSTRACT: In this study, the data about habitat type preferences of the species belonging to Yahyalı (Kayseri) Coreoidea (Hemiptera: Heteroptera) fauna were evaluated.

KEYWORDS: Turkey, Heteroptera, Coreoidea, Yahyalı-Kayseri, habitat preferences.

To cite this article: Kıyak, S., Baş, A., 2021, About Habitat Type Preferences of Some Coreoidea (Hemiptera: Heteroptera) Species of Yahyalı-Kayseri, *J.Het.Turk.*, 3 (1):46-49
DOI:10.5281/zenodo.4839645
To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A6.pdf
Received: Jan 07, 2021; **Revised:** Feb 8, 2021; **Accepted:** Apr 30, 2021; **Published online:** May 31, 2021

In the study conducted by Kıyak & Baş (2020) to identify the Yahyalı (Kayseri) Coreoidea (Heteroptera) fauna between 2011-2012, 16 genera and 25 species from 4 families were recorded (Kıyak & Baş, 2020).

In this study, an ecological evaluation of the samples collected within the scope of Kıyak and Baş (2019) was made. In the study area, Heteroptera records belonging to different species taxa collected from the same or different habitat types were reviewed. The Habitats are classified as "natural vegetation covered areas", "afforestation areas", "agricultural areas (a-Orchards, b-Fields)" according to the habitat preferences of the species identified during the study.

Habitat Preference Rating:

The preferred habitats and specimens numbers of the species identified as a result of the sample collections from different habitats in this study are given below.

A) Natural vegetation covered areas (Herbaceous steppe formation): The samples were collected from the dominant plant species. In this formation, 4 species from Alydidae, 9 species from Coreidae, 10 species from Rhopalidae, and *Dicranocephalus agilis*, which are the only species identified from Stenocephalidae, were found.

B) Afforestation area- (*Pinus nigra* afforestation area): The samples were collected from the herbaceous plant species between the

tree formation. These; 8 species belonging to Coreidae, 4 species belonging to Alydidae, 10 species belonging to Rhopalidae.

C) Agricultural Areas:

a) Orchards: The samples were collected from the herbaceous formation between the orchards. These; 2 species belonging to Aydidae, 5 species belonging to Coreidae, 3 species belonging to Rhopalidae.

b) Fields: The samples were collected from *Triticum aestivum, Hordeum vulgare* fields and plants around them. 4 species belonging to Coreidae, 3 species belonging to Alydidae, 5 species belonging to Rhopalidae were collected from both crop fields and other herbaceous plants species.

Table 1. Habitat distribution of the species in the study area (HS: Herbaceous steppe, PNAA: *Pinus nigra* afforestation area; OR: Orchards; CF: Crop fields)

FAMILIA	**Species**	**Habitat Type**			
		HS	**PNAA**	**OR**	**CF**
Alydidae	*Alydus calcaraus*	+	+		
	Camtopus tragacanthae	+	+	+	+
	Camtopus lateralis	+	+	+	+
	Camtopus illustris	+	+		+
Coreidae	*Coreus marginatus*			+	
	Phyllomorpha lacerata	+	+		
	Syromastus rhombeus	+	+	+	+
	Centrocoris spiniger	+	+		+
	Centrocoris degener	+	+		
	Coriomeris affinis	+	+	+	+
	Coriomeris subglaber	+	+		
	Coriomeris denticulatus	+	+	+	
	Ceraleptus gracilicornis	+	+	+	+
	Loxonemis dentator		+		
Rhopalidae	*Stictopleurus pictus*	+	+		
	Corizus hyosciami	+	+		+
	Rhopalus parumpunctatus	+	+		
	Rhopalus subrufus	+	+		+
	Rhopalus conspersus	+	+	+	
	Maccevethus caucasicus	+	+		+
	Maccevethus lutheri	+	+		
	Chrosoma schillingi	+	+	+	+
	Myrmus miriformis	+	+		+
	Brachycarenus tigrinus	+	+		
Stenocephalidae	*Dicranocephalus agilis*		+		

As shown in Table 1, the species of family Alydidae, Coreidae, Rhopalidae and Stenocephalidae have different habitat preferences. According to the habitat preferences of the species, the highest number of species are respectively *Pinus nigra* afforestation area (24 species), Herbaceous steppe formation (22 species), crop fields (12 species) and orchards (9 species). Also, while *Camtopus tragacanthae*, *Syromastus rhombeus*, *Ceraleptus gracilicornis*, *Chrosoma schillingi* species are found in all habitat types, *Coreus marginatus* and *Dicranocephalus agilis* were found in only one habitat type.

The distribution of 194 Coreoidea specimens caught in the field studies in Yahyalı in months is given in Table.2.

Table 2. Monthly distribution of sample number of Coreoidea superfamily in the study area

June	July	August	September
85	34	65	10

As indicated in Table 2, 85 samples were found in June, 34 samples in July, 65 samples in August and 10 samples in September. The percentage graph of this data distribution is shown in Figure 1.

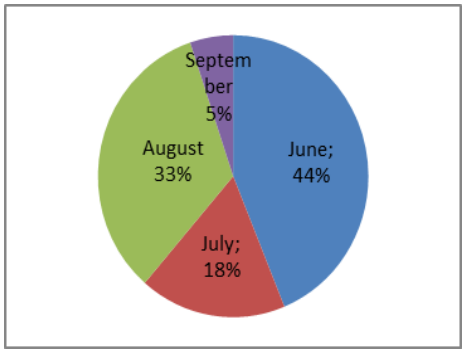


Figure.1 Percentage distribution of samples in the study area by months.

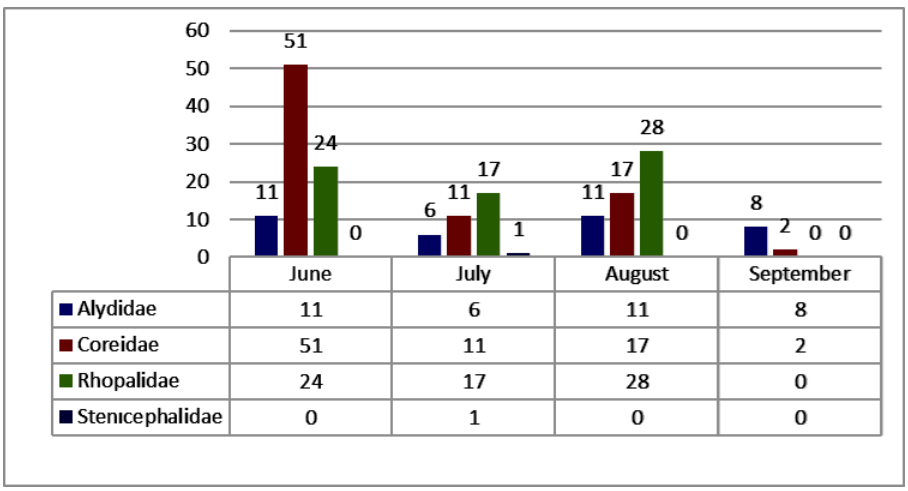


Figure 2. Distribution of collected samples by families and months

Table 3. Distribution of sample number of Coreoidea superfamily according to family and months in the study area

	June	**July**	**August**	**September**
Alydidae	11	6	11	8
Coreidae	51	11	17	2
Rhopalidae	24	17	28	-
Stenocephalidae	-	1	-	-

Of these species *Phyllomorpha lacerata* only in July, *Dicranocephalus agilis* only in July, *Brachycarenus languidus* and *Stictopleurus pictus* only in August, *Loxocnemis dentator* only in June, *Centrocoris degener* only in September, *Coriomeris subglaber* only in June were found.

All the species except the *Chorosoma schillingi* and *Mrymus miriformis* of the Rhopalidae family, which belong to the superfamily Coreoidea, spend the winter as adults.

Therefore, the number of these individuals increases rapidly with the arrival of spring months. In addition, the fact that there is a high amount of food during this

period explains the reason for the high number of samples collected in June.

According to Dolling (2006), all species belonging to the 4 families of this superfamily are phytophage-fed or seed-fed species from the plant's meristematic tissues and sometimes cause damage to plant tissues by causing a decrease in live seed production. Ecological studies of the Coreoidea species are of great importance in terms of habitat preferences and distribution of species and sample numbers by months.

REFERENCES

Dolling, W. R., 2006, *Coreidae Leach, 1815*, 43-101 In: *Catalogue of the Heteroptera of the Palaearctic Region, Pentatomorpha II* (Eds: B. Aukema & Ch. Rieger). The Netherlands Entomological Society, Vol. 5, Amsterdam, xiii + 550 pp.

Kıyak, S., Baş, A., 2020, Contributions to Coreoidea (Hemiptera: Heteroptera) fauna of Kayseri Province (Turkey), *J.Het.Turk.*, 2(1):25-33

JHT
J.Het.Turk.
Journal of the Heteroptera of Turkey
ISSN 2687 - 3249 (online edition)
May, 2021
Volume 3, Issue 1

Research Article

Contribution to the Knowledge of Heteroptera (Hemiptera) Fauna of Elazığ Province with a New Record for the Fauna of Turkey

Barış Çerçi[1]* İnanç Özgen[2]

[1] Faculty of Medicine, Hacettepe University, Ankara, TURKEY

[2] Bioengineering Department, Engineering Faculty, Fırat University, Elazığ, TURKEY

*Corresponsing author E-mail: www.heteropteran99@gmail.com

ABSTRACT: : The result of a field research, focused on the suborder Heteroptera and conducted in several localities in Elazığ province in Eastern Anatolian region of Turkey, is presented. A total of 66 species belonging to following families are recorded: Alydidae (1), Berytidae (2), Coreidae (2), Geocoridae (5), Gerridae (1), Heterogasteridae (1), Lygaeidae (4), Miridae (9), Nabidae (1), Oxycarenidae (2), Pachygronthidae (1), Pentatomidae (17), Reduviidae (3), Rhopalidae (8), Rhyparochromidae (2), Scutelleridae (3) and Tingidae (4). Among them, 27 species are recorded from Elazığ for the first time and *Orthops* (*Montanorthops*) *pilosulus* Jakovlev, 1877 constitutes a new record for the Heteroptera fauna of Turkey. New records for following four species which were recorded only once from Turkey, are given: *Agatharchus* (*Agatharchus*) *ponticus* Belousova, 1999, *Limacocarenus curtulus* Kiritshenko, 1914, *Phytocoris* (*Eckerleinius*) *niveatus* Horváth, 1891 and *Reuteria riegeri torosensis* Çerçi, Tezcan & Özgen, 2020. Finally, a checklist of Heteroptera species of Elazığ province, based on previous literature and new records in this paper, is prepared.

KEYWORDS: New record, Turkey, Heteroptera, Elazığ, fauna, contribution.

To cite this article: 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, *J..Het.Turk.*, 3 (1):50-75

DOI:10.5281/zenodo.4840031

To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A7.pdf

Received: Apr 7, 2021; **Revised:** May 7, 2021; **Accepted:** May 8,, 2021; **Published online:** May 31, 2021

Heteroptera Latreille, 1810 is a diverse suborder of Hemiptera Linnaeus, 1758 that consists of phytophagous, zoophagous, and even hematophagous species. It contains more than 45,000 species described worldwide and more than 8,000 of these distribute in Palaearctic region (Henry, 2017). According to latest overview by Tezcan (2020), 1536 species of Heteroptera have been recorded from Turkey. Heteroptera fauna of Elazığ province remained unnoticed until the 1970s, with the exception of isolated records of 13 species by Hoberlandt (1952), Wagner (1959, 1962),

Brown & Eralp (1962), Tuatay et al. (1967, 1972) and Seidenstücker (1973, 1975). Extensive field research conducted by F. Önder, N. Lodos, E. Pehlivan and A. Çağatay all around Turkey at this time resulted in recording of 48 species from Elazığ (Önder, 1976, 1980, 1982; Lodos & Önder, 1978, 1980, 1982, 1983; Pehlivan, 1981; Çağatay, 1985). Kıyak (1990) wrote the first and still the most extensive paper that specifically focused on the Heteroptera fauna of Elazığ province, recording 80 additional species. More recently, Matocq et al. (2014), dealing with Heteroptera fauna of Diyarbakır, Mardin and Elazığ provinces, greatly enhanced our knowledge by recording an additional 54 species from this province. The latest faunistic paper dealing predominantly with Heteroptera fauna of Elazığ was Çerçi et al. (2018) which recorded 29 more Heteroptera species from Elazığ. Adding all these species and records by some recent papers (Péricart, 1983, 1984, 1998a,b; Özgen et al., 2005, 2018, 2021; Önder et al., 2006; Bolu et al., 2006; Yıldırım et al., 2011, 2013; Özgen, 2012; Ribes & Pagola-Carte, 2013; Dursun & Fent, 2013; Maral et al., 2013; Yazıcı et al., 2015; Özgen & Dioli, 2018, 2019; Dioli & Özgen, 2019), 266 Heteroptera species were recorded from this province until now. With 27 new species recorded from this province in this paper, the total number of Heteroptera species known from Elazığ rises to 293. A checklist of all these species can be found below.

MATERIAL AND METHODS

The study was conducted in ten localities between 12.09.2020 and 30.09.2020. Continental climate is observed in the studied area, summer season is hot and spring season usually short. Vegetation of studied areas is mostly dominated by *Astragalus* spp., *Quercus* spp., *Crataegus* spp. and annual weeds. Shrubs and *Astragalus* spp. are frequent in Haroğlu and Hazarbaba localities, whereas herbaceous plants are frequent in Sivrice locality. Fruit plants and perennial plants surround the sampling areas in all localities. During the field work, specimens were mostly collected by sweeping net and at sight. Collection of semi-aquatic species in the localities Sivrice and Hazarbaba were done using a bucket dipped into water. Trapped specimens were filtered by a net and aspirated. Collected specimens were examined in the laboratory by using an Olympus SZX 7 stereomicroscope. Photographs were taken with Nikon D3300 DSLR Camera combined with an 68mm extension tube and a Lomo 3.7X 0.11 Microscope lens. Stacking of images were done by CombineZM.

Ghauri (1978), Péricart (1983, 1984, 1998a, b), Linnavuori (2000), Ribes et al. (2008), Ribes & Pagola-Carte (2013) and Hosseini (2014) were used for identification of species. Examined specimens are preserved in the private collection of the first author (BCIT).

RESULTS

Following 66 species were found in the field research conducted in several localities in Elazığ. Among them, species denoted with a single asterisk (*) indicate the first record from Elazığ and with double asterisks indicate the first record from Turkey.

ALYDIDAE Amyot & Serville, 1843

Camptopus lateralis (Germar, 1817)

Material examined: Elazığ: Haroğlu, 1850m, 28.09.2020, 1 ex.; Palu, 25.09.2020, 1 ex.; Hazarbaba Mountain, 2000m, 23.09.2020, 1 ex. (BCIT)

BERYTIDAE Fieber, 1851

Neides brevipennis Puton, 1895

Material examined: Elazığ: Sivrice (N 38° 27.518' E 39°29.665') (1100–1400m), 12.09.2020, 1 ex.; Palu (N 38°41.054' E 39°57.412') (1100m), 13.09.2020, 1 ex.; Hazarbaba Mountain (2000m), 23.09. 2020, 1 ex. (BCIT)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

***Neides tipularius* (Linnaeus, 1758)**

Material examined**:** Elazığ: Kozluk (1650m), 20.09.2020, 1 ex. (BCIT)

COREIDAE Leach, 1815

***Coreus marginatus* (Linnaeus, 1758)**

Material examined: Elazığ: Sivrice, Hazar Santrali, 25.09.2020, 1 ex. (BCIT)

***Gonocerus acuteangulatus* (Goeze, 1778)**

Material examined: Elazığ: Sivrice, 26.09.2020, 1 ex.; Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

GEOCORIDAE Baerensprung, 1860

***Geocoris* (*Geocoris*) *megacephalus* (Rossi, 1790)**

Material examined: Elazığ: Palu, 25.09.2020, 1 ex. (BCIT)

***Geocoris* (*Geocoris*) *pubescens* (Jakovlev, 1871) (Fig. 1C)**

Material examined: Elazığ: Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 1 ex.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 1 ex. (BCIT)

***Geocoris* (*Piocoris*) *erythrocephalus erythrocephalus* (Lepelletier & Serville, 1825) (Fig. 1D)**

Material examined: Elazığ: Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 2 exs.; Gökçebağlar (1100m) (N 38°45.239' E 39°14.654'), 12.09.2020, 1 ex.; Sivrice (1100-1400m) (N 38°27.518' E 39°29.665'), 12.09.2020, 1 ex. (BCIT)

***Geocoris* (*Piocoris*) *luridus luridus* (Fieber, 1844) (Fig. 1F)**

Material examined: Elazığ: Palu, 25.09.2020, 1 ex. (BCIT)

***Geocoris* (*Piocoris*) *putonianus* Bergroth, 1892 (Fig. 1E)**

Material examined: Elazığ: Hazarbaba Mountain (2000m), 23.09.2020, 5 exs. (BCIT)

GERRIDAE Leach, 1815

***Gerris* (*Gerris*) *costae fieberi* Stichel, 1938**

Material examined: Elazığ: Hazarbaba Mountain (2000m), 23.09.2020, 8 exs. (BCIT)

HETEROGASTERIDAE Stål, 1862

***Heterogaster affinis* Herrich-Schäffer, 1835**

Material examined: Elazığ: Sivrice, 26.09.2020, 1 ex. (BCIT)

LYGAEIDAE Schilling, 1829

***Lygaeus equestris* (Linnaeus, 1758)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 2 exs. (BCIT)

***Nysius helveticus* (Herrich-Schäffer, 1850) (Fig. 1A)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 12 exs; Haroğlu (1850m), 28.09.2020, 3exs; Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 10 exs; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 2 exs; Hazarbaba Mountain (2000m)-26.09.2020, 7 exs.; Hazarbaba Mountain (2000m), 23.09.2020, 3 exs. (BCIT)

***Ortholomus carinatus* (Lindberg, 1932) (Fig. 1B)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex.; Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 6 exs; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 5 exs; Hazarbaba Mountain (2000m), 26.09.2020, 1 ex. (BCIT)

***Spilostethus saxatilis* (Scopoli, 1763)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 5 exs; Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 1 ex.; Sivrice, 25.09.2020, 1 ex. (BCIT)

MIRIDAE Hahn, 1833

***Deraeocoris* (*Camptobrochis*) *serenus* (Douglas & Scott, 1868) (Fig. 2A)**

Material examined: Elazığ: Kozluk (1650m), 20.09.2020, 1 ex.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 1 ex. (BCIT)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

***Deraeocoris* (*Knightocapsus*) *lutescens* (Schilling, 1837)**

Material examined: Elazığ: Karakoçan, 25.09.2020, 1 ex., Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

***Liocoris tripustulatus* (Fabricius, 1781)**

Material examined: Elazığ: Sivrice, 25.09.2020, 1 ex. (BCIT)

***Malacocoris chlorizans* (Panzer, 1794)**

Material examined: Elazığ: Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

****Orthops* (*Montanorthops*) *pilosulus* Jakovlev, 1877 (Fig. 2B)**

Material examined: Elazığ: Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 4 exs. (BCIT)

Comments: This species was originally described from Iran and besides, known from Kazakhstan, Kirgizia, East Siberian region of Russia, Turkmenistan and Uzbekistan (Kerzhner & Josifov, 1999). It is characterized by entirely orange-red coloration and red markings on dorsum. A similar species, *O.* (*M.*) *sanguinolentus* (Reuter, 1879) that is also distributed in the same area, is possibly only a synonym of *O.* (*M.*) *pilosulus* (see Hosseini, 2014). The species of *Orthops* known from Turkey were recently reviewed by Yazıcı & Yıldırım (2017). Four species belonging to *Orthops* (*Orthops*) and two species belonging to *Orthops (Montanorthops*) were recorded (Yazıcı & Yıldırım, 2017). The latter differs from the former by the remarkably deep punctation of pronotum, very short collar hairs and pale spines of tibiae (Hosseini, 2014). The two species of *Montanorthops* recorded from Turkey are *Orthops* (*M.*) *forelii* Fieber, 1858 and *O.* (*M.*) *montanus* (Schilling, 1837). *Orthops forelii* can be easily distinguished from *O. pilosulus* by the extensive black coloration of dorsum (Ghauri, 1978). *Orthops montanus* is similar to *O. pilosulus* with respect to general orange-red coloration and red markings but differs from it by black calli of pronotum and dark patches of first antennal segment (Ghauri, 1978), both of which unicolorous pale in *O. pilosulus*.

***Phytocoris* (*Eckerleinius*) *niveatus* Horváth, 1891 (Fig. 2C–D)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 6 ex. (BCIT)

Comments: A rare species that lives on *Astragalus* sp. and lives in mountain steppes (Linnavuori, 2000). It is known from mountainous regions of Armenia, Azerbaijan, Iran and Turkey (Kerzhner & Josifov, 1999). It was only recorded once in Turkey, from Ağrı by Kiritshenko (1918). This species can be easily distinguished from its congeners by the very characteristic shape of its left paramere which has two adjacent indentations basally [cf. Linnavuori (2000): Fig. 1F–J].

***Phytocoris* (*Stictophytocoris*) *linnavuorii* Kerzhner & Schuh, 1998**

Material examined: Elazığ: Sivrice (1100-1400m) (N 38°27.518' E 39°29.665'), 12.09.2020, 1 ex.; Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

***Reuteria riegeri torosensis* Çerçi, Tezcan & Özgen, 2020**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 3 exs (BCIT)

Comments: This species was described very recently from Mersin and Kahramanmaraş (Çerçi et al., 2020). It is very similar to *Reuteria serratis* Çerçi, Tezcan & Özgen, 2020, which is known from Siirt, and can only be distinguished from it by the male genital structures (Çerçi et al., 2020).

NABIDAE A. Costa, 1853

***Nabis* (*Aspilaspis*) *viridulus* Spinola, 1837 (Fig. 6B)**

Material examined: Elazığ: Palu, 25.09.2020, 10 exs. (BCIT)

OXYCARENIDAE Stål, 1862

***Macroplax fasciata* (Herrich-Schäffer, 1835)**

Material examined: Elazığ: Haroğlu (1800m)

(N 38°36.989' E 38°54.882'), 14.09.2020, 1 ex.

***Oxycarenus* (*Euoxycarenus*) *pallens* (Herrich-Schäffer, 1850)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 2 exs.; Haroğlu (1850m), 28.09.2020, 1 ex; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 1 ex. (BCIT)

PACHYGRONTHIDAE Stål, 1865

***Cymophyes ochroleuca* Fieber, 1870 (Fig. 1G)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

PENTATOMIDAE Leach, 1815

***Aelia rostrata* Boheman, 1852**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 2 exs.; Haroğlu (1850m), 28.09.2020, 6 exs.; Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 1 ex. (BCIT)

****Agatharchus* (*Agatharchus*) *ponticus* Belousova, 1999 (Fig. 3A–C)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

Comments: This species was originally described based on a single male specimen collected from Erzurum by Belousova (1999). It is only known from its holotype and characterized by clypeus shorter than mandibular plates, second antennal segment only 1,2 times as long as the third one (Fig. 3A), evaporatorium of scent glands enlarged (Fig. 3B) and very small size (only 3 mm) of vesica (Fig. 3C) (Ribes & Pagola-Carte, 2013). Although the holotype lacks a median white stripe along pronotum and scutellum; short clypeus, short second antennal segment, large evaporatorium of scent gland and very short vesica confirm that the examined specimen belongs to this species. Following four species of *Agatharchus* (*Agatharchus*) are also known from Turkey: *A. escalerae* Horváth, 1901, *A. herrichii* (Kolenati, 1846), *A. linea* (Klug, 1845) and *A. tritaenia* Horváth, 1897 (Rider, 2006). *Agatharchus tritaena* and *A. escalerae* differ from *A. ponticus* by clypeus as long as jugae, *A. linea* differs by very small evaporatorium of scent gland and *A. herrichii* differs by second antennal segment 1.4–1.8 times as long as third one and the very large vesica (more than 4 mm) (Belousova, 1999).

***Ancyrosoma leucogrammes* (Gmelin, 1790)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 1 ex.; Habibuşağı (1000–1300m, (N 38°25.693' E 38° 49.214'), 14.09.2020, 1 ex.; Palu (1100m) (N 38°41.054' E 39°57.412'), 13.09.2020, 1 ex.; Sivrice (1100-1400m) (N 38°27.518' E 39°29.665'), 12.09.2020, 1 ex.; Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT).

***Antheminia lunulata* (Goeze, 1778) (Fig. 4B)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex.; Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 2 ex.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 5 ex. (BCIT).

****Carpocoris* (*Carpocoris*) *coreanus* Distant, 1899 (Fig. 4A)**

Material examined: Elazığ: Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 1 ex. (BCIT)

***Carpocoris* (*Carpocoris*) *pudicus* (Poda, 1761)**

Material examined: Elazığ: Günbağı/ Kozluk (1650m), 01.10.2020, 2 exs; Haroğlu (1850m), 28.09.2020, 2 exs.; Sivrice (1100–1400m) (N 38°27.518' E 39°29.665'), 12.09.2020, 1 ex.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 2 exs. (BCIT)

***Codophila varia* (Fabricius, 1787)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 2 exs.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 1 ex.; Gökçebağlar (1100m) (N 38°45.239' E 39°14.654'), 12.09.2020, 1 ex.; Sivrice, 26.09.2020, 1 ex.; Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

***Dolycoris baccarum* (Linnaeus, 1758)**

Material examined: Elazığ: Sivrice, 25.09.2020, 1 ex. (BCIT)

***Eurydema* (*Eurydema*) *ornata* (Linnaeus, 1758)**

Material examined: Elazığ: Kozluk (1650m), 20.09.2020, 1 ex. (BCIT)

***Eysarcoris ventralis* (Westwood, 1837)**

Material examined: Elazığ: Palu, 25.09.2020, 1 ex. (BCIT)

***Neottiglossa leporina* (Herrich-Schäffer, 1830)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 3 exs.; Haroğlu (1850m), 28.09.2020, 1 ex.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 3 exs. (BCIT)

***Sciocoris (Aposciocoris) macrocephalus* Fieber, 1851**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 2 exs; Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

***Sciocoris* (*Sciocoris*) *cursitans cursitans* (Fabricius, 1794)**

Material examined: Elazığ: Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

***Stagonomus bipunctatus bipunctatus* Linnaeus, 1758**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

***Stagonomus devius* Seidenstücker, 1965 (Fig. 4C)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

***Staria lunata* (Hahn, 1835)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 1 ex.; Haroğlu (1850m), 28.09.2020, 1 ex.; Gökçebağlar (1100m) (N 38°45.239' E 39°14.654'), 12.09.2020, 1 ex.; Sivrice (1100-1400m) (N 38°27.518' E 39°29.665'), 12.09.2020, 2 exs.; Sivrice, 25.09.2020, 1 ex. (BCIT)

***Trochiscocoris hemipterus* (Jakovlev, 1879) (Fig. 4D)**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 2 exs. (BCIT)

REDUVIIDAE Latreille, 1807

***Callistodema fasciata* (Kolenati, 1857)**

Material examined: Elazığ: Palu, 25.09.2020, 1 ex. (BCIT)

***Coranus* (*Coranus*) *tuberculifer* Reuter, 1881**

Material examined: Elazığ: Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 1 ex. (BCIT)

***Nagusta goedelii* (Kolenati, 1857)**

Material examined: Elazığ: Karakoçan, 25.09.2020, 2 exs.; Sivrice, 26.09.2020, 1 ex. (BCIT)

RHOPALIDAE Amyot & Serville, 1843

***Agraphopus lethierryi* Stål, 1872**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

***Brachycarenus tigrinus* (Schilling, 1829)**

Material examined: Elazığ: Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 2 exs. (BCIT)

***Chorosoma schillingii* (Schilling, 1829) (Fig. 5A)**

Material examined: Elazığ: Kozluk (1650m), 20.09.2020, 3 exs.; Haroğlu (1850m), 28.09.2020, 7 exs.; Haroğlu (2100m), 21.09.2020, 4 exs.; Habibuşağı (1000-1300m) (N 38°25.693' E 38° 49.214'), 14.09.2020, 3 exs; Sivrice (1100 -1400m) (N 38°27.518' E 39°29.665'), 12.09.2020, 4 exs.; Hazarbaba Mountain (2000m), 26.09.2020, 2 exs.; Hazarbaba Mountain (2000m), 23.09.2020, 3 exs. (BCIT)

***Corizus hyoscyami hyoscyami* (Linnaeus, 1758)**

Material examined: Elazığ: Kozluk (1650m), 20.09.2020, 1 ex.; Haroğlu (2100m), 21.09.2020, 1 ex.; Günbağı/ Kozluk (1650m), 01.10.2020, 5 exs.; Haroğlu (1900m) (N 38°36.981' E 38° 54.882'), 16.09.2020, 4 exs.; Sivrice, 25.09.2020, 2 exs. (BCIT)

***Limacocarenus curtulus* Kiritshenko, 1914 (Fig. 5C–D, F)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 3 exs.; Günbağı/ Kozluk (1650m), 01.10.2020, 1 ex. (BCIT)

Comments: This species was originally described from Semarkand, Uzbekistan and recorded from Afghanistan, Iran, Kazakhstan, Kirgizia and Turkey (Göllner -Scheiding, 1978; Ghahari et al., 2012). It was only recorded once in Turkey, from Malatya by Göllner-Scheiding (1978). This species is characterized by remarkable thorn like projections next to antennal base (Fig. 5F). According to Göllner-Scheiding (1978), head of this species is remarkably short when compared to *Rhopalus parumpunctatus* (Fig. 5B, E). But all four specimens that we examined have longer heads (Fig. 5F) when compared to *R. parumpunctatus* (Fig. 5E). It is possible that the Anatolian populations differ from Central Asian populations in this aspect.

***Liorhyssus hyalinus* (Fabricius, 1794)**

Material examined: Elazığ: Kozluk (1650m), 20.09.2020, 6 exs.; Haroğlu (2100m), 21.09.2020, 1 ex.; Günbağı/ Kozluk (1650m), 01.10.2020, 4 exs.; Haroğlu (1900m) (N 38°36.981' E 38° 54.882'), 16.09.2020, 3 exs. (BCIT)

***Maccevethus caucasicus* (Kolenati, 1845)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 4 exs.; Haroğlu (1850m), 28.09.2020, 1 ex.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 3 exs.; Sivrice, 26.09.2020, 1 ex.; Hazarbaba Mountain (2000m), 26.09.2020, 2 exs. (BCIT)

***Rhopalus* (*Rhopalus*) *parumpunctatus* Schilling, 1829 (Fig. 5B, E)**

Material examined: Elazığ: Kozluk (1650m), 20.09.2020, 2 exs; Haroğlu (2100m), 21.09.2020, 13 exs.; Haroğlu (1850m), 28.09.2020, 13 exs.; Haroğlu (1900m) (N 38°36.981' E 38°54.882'), 16.09.2020, 3 exs.; Hazarbaba Mountain (2000m), 26.09.2020, 5 exs.; Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

RHYPAROCHROMIDAE Amyot & Serville, 1843

***Lasiocoris anomalus* (Kolenati, 1845)**

Material examined: Elazığ: Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

***Xanthochilus minusculus* (Reuter, 1885)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 1 ex. (BCIT)

SCUTELLERIDAE Leach, 1815

***Odontotarsus impictus* Jakovlev, 1886**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

***Odontotarsus robustus* Jakovlev, 1884**

Material examined: Elazığ: Günbağı/ Kozluk (1650m), 01.10.2020, 1 ex.; Haroğlu (1850m), 28.09.2020, 1 ex. (BCIT)

***Odontotarsus rufescens* Fieber, 1861**

Material examined: Elazığ: Haroğlu (1850m), 28.09.2020, 2 ex.; Hazarbaba Mountain (2000m), 23.09.2020, 1 ex. (BCIT)

TINGIDAE Laporte, 1832

***Copium adumbratum* (Horváth, 1891) (Fig. 6D)**

Material examined: Elazığ: Haroğlu (1800m) (N 38°36.989' E 38°54.882'), 14.09.2020, 2 exs. (BCIT)

***Elasmotropis testacea selecta* (Horváth, 1891)**

Material examined: Elazığ: Hazarbaba Mountain (2000m), 26.09.2020, 5 exs. (BCIT)

***Monosteira unicostata* (Mulsant & Rey, 1852)**

Material examined: Elazığ: Sivrice, 25.09.2020, 2 exs. (BCIT)

***Stephanitis* (*Stephanitis*) *oschanini* Vasiliev, 1935 (Fig. 6C)**

Material examined: Elazığ: Haroğlu (2100m), 21.09.2020, 2 exs.; Karakoçan, 25.09.2020, 3 exs. (BCIT)

Checklist of Heteroptera Species Recorded from Elazığ

Below, a checklist of 293 Heteroptera species recorded from Elazığ is presented. The number of species in each family is given in brackets. Reference for each species refers to the publication in which the corresponding species was recorded from Elazığ for the first time.

Lygocoris (*Lygocoris*) *rugicollis* (Fallén, 1807) recorded by Kıyak (1990) and *Antheminia absinthii* (Wagner, 1952) mentioned by Önder et al. (2006) from Elazığ are not included in this checklist as their presence in Elazığ is doubtful, considering their Asiatico-European and West Mediterranean distributions, respectively (Kerzhner & Josifov, 1999; Ribes & Pagola-Carte, 2013).

	Species	Reference
ALYDIDAE (4)		
1	*Camptopus bifasciatus* Fieber, 1864	(Kıyak, 1990)
2	*Camptopus illustris* Horváth, 1899	(Pehlivan, 1981)
3	*Camptopus lateralis* (Germar, 1817)	(Pehlivan, 1981)
4	*Camptopus tragacanthae* (Kolenati, 1845)	(Pehlivan, 1981)
ANTHOCORIDAE (8)		
5	*Anthocoris minki pistaciae* Wagner, 1957	(Önder, 1982)
6	*Anthocoris nemoralis* (Fabricius, 1794)	(Önder, 1982)
7	*Anthocoris pilosus* (Jakovlev, 1877)	(Önder, 1982)
8	*Cardiastethus nazarenus* Reuter, 1884	(Önder, 1982)
9	*Orius* (*Orius*) *niger* (Wolff, 1811)	(Önder, 1982)
10	*Orius* (*Heterorius*) *horvathi* (Reuter, 1884)	(Önder, 1982)
11	*Orius* (*Heterorius*) *minutus* (Linnaeus, 1758)	(Önder, 1982)
12	*Xylocoris* (*Arrostelus*) *flavipes* (Reuter, 1875)	(Özgen et al., 2018)
ARTHENEIDAE (5)		
13	*Artheneis balcanica* (Kormilev, 1938)	(Matocq et al., 2014)
14	*Artheneis hyrcanica* (Kolenati, 1845)	(Matocq et al., 2014)
15	*Artheneis intricata* V.G. Putshkov, 1969	(Péricart, 1998a)
16	*Artheneis wagneri* Ribes, 1972	(Péricart, 1998a)
17	*Holcocranum saturejae* (Kolenati, 1845)	(Çerçi et al., 2018)
BERYTIDAE (5)		
18	*Berytinus* (*Lizinus*) *distinguendus* (Ferrari, 1874)	(Çerçi et al., 2018)
19	*Berytinus* (*Lizinus*) *striola* (Ferrari, 1874)	(Çerçi et al., 2018)
20	*Metacanthus* (*Cardopostethus*) *annulosus* (Fieber, 1859)	(Matocq et al., 2014)
21	*Neides brevipennis* Puton, 1895	(Péricart, 1984)
22	*Neides tipularius* (Linnaeus, 1758)	(this paper)

BLISSIDAE (1)		
23	*Dimorphopterus blissoides* (Baerensprung, 1859)	(Çerçi et al., 2018)
COREIDAE (16)		
24	*Anoplocerus luteus* (Fieber, 1861)	(Matocq et al., 2014)
25	*Arenocoris waltlii* (Herrich-Schäffer, 1835)	(Çerçi et al., 2018)
26	*Centrocoris variegatus* Kolenati, 1845	(Kıyak, 1990)
27	*Coreus marginatus* (Linnaeus, 1758)	(Kıyak, 1990)
28	*Coriomeris affinis* (Herrich-Schäffer, 1839)	(Kıyak, 1990)
29	*Coriomeris hirticornis* (Fabricius, 1794)	(Kıyak, 1990)
30	*Coriomeris subglaber* Horváth, 1917	(Kıyak, 1990)
31	*Gonocerus acuteangulatus* (Goeze, 1778)	(this paper)
32	*Gonocerus insidiator* (Fabricius, 1787)	(Matocq et al., 2014)
33	*Gonocerus juniperi* Herrich-Schäffer, 1839	(Çerçi et al., 2018)
34	*Haploprocta sulcicornis* (Fabricius, 1794)	(Kıyak, 1990)
35	*Phyllomorpha lacerata* Herrich-Schäffer, 1835	(Kıyak, 1990)
36	*Phyllomorpha laciniata* (Villers, 1789)	(Kıyak, 1990)
37	*Prionotylus brevicornis* (Mulsant & Rey, 1852)	(Matocq et al., 2014)
38	*Spathocera tenuicornis* Jakovlev, 1883	(Kıyak, 1990)
39	*Syromastus rhombeus* (Linnaeus, 1767)	(Kıyak, 1990)
CYDNIDAE (2)		
40	*Canthophorus melanopterus melanopterus* (Herrich-Schäffer, 1835)	(Lodos & Önder, 1980)
41	*Tritomegas delagrangei* (Puton, 1888)	(Matocq et al., 2014)
GEOCORIDAE (5)		
42	*Geocoris* (*Geocoris*) *megacephalus* (Rossi, 1790)	(this paper)
43	*Geocoris* (*Geocoris*) *pubescens* (Jakovlev, 1871)	(this paper)
44	*Geocoris* (*Piocoris*) *erythrocephalus erythrocephalus* (Lepelletier & Serville, 1825)	(Kıyak, 1990)
45	*Geocoris* (*Piocoris*) *luridus luridus* (Fieber, 1844)	(Matocq et al., 2014)
46	*Geocoris* (*Piocoris*) *putonianus* Bergroth, 1892	(Matocq et al., 2014)
GERRIDAE (2)		
47	*Aquarius ventralis* (Fieber, 1860)	(Yıldırım et al., 2013)
48	*Gerris* (*Gerris*) *costae fieberi* Stichel, 1938	(this paper)
HETEROGASTERIDAE (2)		
49	*Heterogaster affinis* Herrich-Schäffer, 1835	(this paper)
50	*Heterogaster cathariae* (Geoffroy, 1785)	(Çerçi et al., 2018)

LYGAEIDAE (12)		
51	*Apterola* (*Apterola*) *kuenckeli rubicunda* (Stål, 1872)	(Çerçi et al., 2018)
52	*Horvathiolus superbus* (Pollich, 1781)	(Özgen & Dioli, 2019)
53	*Lygaeus equestris* (Linnaeus, 1758)	(Kıyak, 1990)
54	*Lygaeus simulans* Deckert, 1985	(Péricart, 1998a)
55	*Melanocoryphus albomaculatus* (Goeze, 1778)	(Kıyak, 1990)
56	*Nysius cymoides* (Spinola, 1837)	(Çerçi et al., 2018)
57	*Nysius thymi thymi* (Wolff, 1804)	(Matocq et al., 2014)
58	*Nysius helveticus* (Herrich-Schäffer, 1850)	(Özgen et al., 2021)
59	*Orsillus depressus* (Mulsant & Rey, 1852)	(Péricart, 1998a)
60	*Ortholomus carinatus* (Lindberg, 1932)	(this paper)
61	*Spilostethus pandurus* (Scopoli, 1763)	(Kıyak, 1990)
62	*Spilostethus saxatilis* (Scopoli, 1763)	(Kıyak, 1990)
MIRIDAE (61)		
63	*Acetropis* (*Acetropis*) *carinata* (Herrich-Schäffer, 1841)	(Özgen & Dioli, 2019)
64	*Adelphocoris lineolatus* (Goeze, 1778)	(Tuatay et al., 1967)
65	*Adelphocoris vandalicus* (Rossi, 1790)	(Önder et al., 2006)
66	*Atractotomus amygdali* Wagner, 1960	(Matocq et al., 2014)
67	*Alloeomimus kurdus* Hoberlandt, 1953	(Özgen et al., 2018)
68	*Auchenocrepis reuteri* Jakovlev, 1876	(Matocq et al., 2014)
69	*Barbarosia decalvata* (Seidenstücker, 1962)	(Matocq et al., 2014)
70	*Brachycoleus steini* Reuter, 1877	(Özgen & Dioli, 2019)
71	*Brachycoleus thoracicus* Puton, 1892	(Matocq et al., 2014)
72	*Calocoris roseomaculatus angularis* (Fieber, 1864)	(Önder, 1976)
73	*Calocoris roseomaculatus saucius* Linnavuori, 1951	(Matocq et al., 2014)
74	*Campylomma diversicorne* Reuter, 1878	(Önder, 1976)
75	*Chlorillus pictoides* Wagner, 1963	(Matocq et al., 2014)
76	*Closterotomus norwegicus* (Gmelin, 1790)	(Çerçi et al., 2018)
77	*Closterotomus trivialis* (A. Costa, 1853)	(Matocq et al., 2014)
78	*Cyphodema instabilis* (Lucas, 1849)	(Matocq et al., 2014)
79	*Deraeocoris* (*Camptobrochis*) *punctulatus* (Fallén, 1807)	(Matocq et al., 2014)
80	*Deraeocoris* (*Camptobrochis*) *serenus* (Douglas & Scott, 1868)	(Önder, 1976)
81	*Deraeocoris* (*Deraeocoris*) *rutilus* (Herrich-Schäffer, 1838)	(Önder, 1976)
82	*Deraeocoris* (*Deraeocoris*) *trifasciatus* (Linnaeus, 1767)	(Önder, 1976)
83	*Deraeocoris* (*Knightocapsus*) *lutescens* (Schilling, 1837)	(Matocq et al., 2014)
84	*Deraeocoris* (*Knightocapsus*) *putoni* (Montandon, 1885)	(Çerçi et al., 2018)
85	*Dryophilocoris* (*Camarocyphus*) *persimilis* (Puton, 1895)	(Matocq et al., 2014)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

86	*Glaucopterum kareli* Wagner, 1963	(Önder, 1976)
87	*Globiceps* (*Globiceps*) *sphaegiformis* (Rossi, 1790)	(Özgen & Dioli, 2019)
88	*Globiceps* (*Kelidocoris*) *horvathi* Reuter, 1912	(Çerçi et al., 2018)
89	*Grypocoris* (*Grypocoris*) *fieberi* Douglas & Scott, 1868	(Önder, 1976)
90	*Horistus* (*Primihoristus*) *orientalis* (Gmelin, 1790)	(Matocq et al., 2014)
91	*Icodema infuscata* (Fieber, 1861)	(Matocq et al., 2014)
92	*Liocoris tripustulatus* (Fabricius, 1781)	(Önder, 1976)
93	*Lygocoris* (*Lygocoris*) *pernicoides* Seidenstücker, 1957	(Kıyak, 1990)
94	*Lygus gemellatus* (Herrich-Schäffer, 1835)	(Önder, 1976)
95	*Lygus pratensis* (Linnaeus, 1758)	(Tuatay et al., 1967)
96	*Lygus rugulipennis* Poppius, 1911	(Önder, 1976)
97	*Macrotylus* (*Alloeonycha*) *ancyranus* Seidenstücker, 1969	(Matocq et al., 2014)
98	*Macrotylus* (*Alloeonycha*) *dentifer* Wagner, 1969	(Matocq et al., 2014)
99	*Macrotylus* (*Macrotylus*) *galatinus* Seidenstücker, 1968	(Matocq et al., 2014)
100	*Macrotylus* (*Macrotylus*) *perdictus* Kiritshenko, 1938	(Matocq et al., 2014)
101	*Macrotylus* (*Macrotylus*) *syriacus* Wagner, 1963	(Matocq et al., 2014)
102	*Malacocoris chlorizans* (Panzer, 1794)	(this paper)
103	*Megacoelum quercicola* Linnavuori, 1965	(Özgen & Dioli, 2018)
104	*Oncotylus* (*Cylindromelus*) *setulosus* (Herrich-Schäffer, 1837)	(Kıyak, 1990)
105	*Orthops* (*Montanorthops*) *pilosulus* Jakovlev, 1877	(this paper)
106	*Phytocoris* (*Eckerleinius*) *niveatus* Horváth, 1891	(this paper)
107	*Phytocoris* (*Stictophytocoris*) *linnavuorii* Kerzhner & Schuh, 1998	(this paper)
108	*Plagiognathus bipunctatus bipunctatus* Reuter,1883	(Önder, 1976)
109	*Plagiognathus* (*Plagiognathus*) *marivanensis* Linnavuori, 2010	(Matocq et al., 2014)
110	*Platycranus* (*Platycranus*) *putoni* Reuter, 1879	(Önder, 1976)
111	*Platyporus dorsalis* Reuter, 1890	(Matocq et al., 2014)
112	*Psallus* (*Apocremnus*) *skylla* Linnavuori, 1994	(Matocq et al., 2014)
113	*Psallus* (*Hylopsallus*) *perrisi* (Mulsant & Rey, 1852)	(Matocq et al., 2014)
114	*Psallus* (*Phylidea*) *quercus* (Kirschbaum, 1856)	(Özgen & Dioli, 2019)
115	*Rauniella ishtar* (Linnavuori, 1984)	(Matocq et al., 2014)
116	*Reuteria riegeri torosensis* Çerçi, Tezcan & Özgen, 2020	(this paper)
117	*Rhabdomiris striatellus wagneri* Kerzhner & Schuh 1998	(Matocq et al., 2014)
118	*Stenodema* (*Stenodema*) *turanica* Reuter, 1904	(Önder, 1976)
119	*Stethoconus pyri* (Mella, 1869)	(Özgen et al., 2018)
120	*Strongylocoris niger* (Herrich-Schäffer, 1835)	(Matocq et al., 2014)

121	*Trigonotylus pulchellus* (Hahn, 1834)	(Çerçi et al., 2018)
122	*Trigonotylus tenuis* Reuter, 1893	(Matocq et al., 2014)
123	*Tuponia* (*Chlorotuponia*) *hippophaes* (Fieber, 1861)	(Matocq et al., 2014)
NABIDAE (8)		
124	*Nabis* (*Aspilaspis*) *viridulus* Spinola, 1837	(this paper)
125	*Nabis* (*Nabis*) *ferus* (Linnaeus, 1758)	(Kıyak, 1990)
126	*Nabis* (*Nabis*) *palifer* Seidenstücker, 1954	(Tuatay et al., 1972)
127	*Nabis* (*Nabis*) *pseudoferus orientarius* Remane, 1962	(Kıyak, 1990)
128	*Nabis* (*Nabis*) *punctatus* A. Costa, 1847	(Kıyak, 1990)
129	*Nabis* (*Nabis*) *rugosus* (Linnaeus, 1758)	(Kıyak, 1990)
130	*Prostemma* (*Prostemma*) *guttula asiaticum* Kerzhner, 1968	(Özgen et al., 2021)
131	*Prostemma* (*Prostemma*) *sanguineum* (Rossi, 1790)	(Çerçi et al., 2018)
OCHTERIDAE (1)		
132	*Ochterus* (*Ochterus*) *marginatus* (Latreille, 1804)	(Hoberlandt, 1952)
OXYCARENIDAE (3)		
133	*Brachyplax tenuis* (Mulsant & Rey, 1852)	(Matocq et al., 2014)
134	*Macroplax fasciata* (Herrich-Schäffer, 1835)	(Çağatay, 1985)
135	*Oxycarenus* (*Euoxycarenus*) *pallens* (Herrich-Schäffer, 1850)	(Çağatay, 1985)
PACHYGRONTHIDAE (1)		
136	*Cymophyes ochroleuca* Fieber, 1870	(Matocq et al., 2014)
PENTATOMIDAE (61)		
137	*Aelia albovittata* Fieber, 1868	(Kıyak, 1990)
138	*Aelia alticola* Kiritshenko, 1914	(Matocq et al., 2014)
139	*Aelia melanota* Fieber, 1868	(Wagner, 1959)
140	*Aelia rostrata* Boheman, 1852	(Kıyak, 1990)
141	*Aelia virgata* (Herrich-Schäffer, 1841)	(Wagner, 1959)
142	*Agatharchus* (*Agatharchus*) *ponticus* Belousova, 1999	(this paper)
143	*Ancyrosoma leucogrammes* (Gmelin, 1790)	(Kıyak, 1990)
144	*Antheminia lunulata* (Goeze, 1778)	(Kıyak, 1990)
145	*Antheminia pusio pusio* (Kolenati, 1846)	(Kıyak, 1990)
146	*Apodiphus amygdali* (Germar, 1817)	(Kıyak, 1990)
147	*Bagrada (Nitilia) abeillei* Puton, 1881	(Matocq et al., 2014)
148	*Bagrada (Nitilia) stolida* (Herrich-Schäffer, 1839)	(Matocq et al., 2014)
149	*Carpocoris* (*Carpocoris*) *coreanus* Distant, 1899	(this paper)

150	*Carpocoris* (*Carpocoris*) *fuscipinus* (Boheman, 1851)	(Kıyak, 1990)
151	*Carpocoris* (*Carpocoris*) *mediterraneus mediterraneus* Tamanini, 1958	(Kıyak, 1990)
152	*Carpocoris* (*Carpocoris*) *melanocerus* (Mulsant & Rey, 1852)	(Kıyak, 1990)
153	*Carpocoris* (*Carpocoris*) *pudicus* (Poda, 1761)	(Kıyak, 1990)
154	*Carpocoris* (*Carpocoris*) *purpureipennis* (De Geer, 1773)	(Kıyak, 1990)
155	*Chlorochroa* (*Rhytidolomia*) *pinicola* (Mulsant & Rey, 1852)	(Ribes & Pagola-Carte, 2013)
156	*Cnephosa flavomarginata* Jakovlev, 1880	(Kıyak, 1990)
157	*Codophila varia* (Fabricius, 1787)	(Kıyak, 1990)
158	*Derula flavoguttata* Mulsant & Rey, 1856	(Kıyak, 1990)
159	*Dolycoris baccarum* (Linnaeus, 1758)	(Kıyak, 1990)
160	*Dyroderes umbraculatus* (Fabricius, 1775)	(Matocq et al., 2014)
161	*Eurydema* (*Horvatheurydema*) *fieberi* Fieber, 1837	(Matocq et al., 2014)
162	*Eurydema* (*Horvatheurydema*) *rugulosa* (Dohrn, 1860)	(Matocq et al., 2014)
163	*Eurydema* (*Eurydema*) *ornata* (Linnaeus, 1758)	(Kıyak, 1990)
164	*Eurydema* (*Eurydema*) *laticollis* Horváth, 1907	(Çerçi et al., 2018)
165	*Eurydema* (*Eurydema*) *putoni* (Jakovlev, 1877)	(Matocq et al., 2014)
166	*Eysarcoris ventralis* (Westwood, 1837)	(Kıyak, 1990)
167	*Graphosoma* (*Graphosoma*) *consimile* Horváth, 1903	(Kıyak, 1990)
168	*Graphosoma* (*Graphosoma*) *melanoxanthum* Horváth, 1903	(Kıyak, 1990)
169	*Graphosoma* (*Graphosoma*) *semipunctatum* (Fabricius, 1775)	(Kıyak, 1990)
170	*Graphosoma* (*Graphosoma*) *stali* Horváth, 1881	(Seidenstücker, 1975)
171	*Graphosoma* (*Graphosomella*) *inexpectatum* Carapezza & Jindra, 2008	(Çerçi et al., 2018)
172	*Holcogaster fibulata* (Germar, 1831)	(Matocq et al., 2014)
173	*Mustha spinosula* (Lefebvre, 1831)	(Kıyak, 1990)
174	*Mustha vicina* Hoberlandt, 1997	(Bolu et al., 2006)
175	*Neottiglossa leporina* (Herrich-Schäffer, 1830)	(this paper)
176	*Palomena prasina* (Linnaeus, 1761)	(Özgen et al., 2005)
177	*Pausias* (*Pausias*) *martini* (Puton, 1890)	(Bolu et al., 2006)
178	*Peribalus* (*Peribalus*) *strictus strictus* (Fabricius, 1803)	(Matocq et al., 2014)
179	*Peribalus* (*Peribalus*) *strictus vernalis* (Wolff, 1804)	(Kıyak, 1990)
180	*Piezodorus lituratus* (Fabricius, 1794)	(Kıyak, 1990)
181	*Sciocoris* (*Aposciocoris*) *luteolus* Fieber, 1861	(Lodos & Önder, 1982)
182	*Sciocoris (Aposciocoris) macrocephalus* Fieber, 1851	(this paper)
183	*Sciocoris* (*Neosciocoris*) *pallens* Klug, 1845	(Kıyak, 1990)
184	*Sciocoris* (*Sciocoris*) *cursitans cursitans* (Fabricius, 1794)	(Lodos & Önder, 1982)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

185	*Sciocoris* (*Sciocoris*) *helferii* Fieber, 1851	(Lodos & Önder, 1982)
186	*Sciocoris* (*Sciocoris*) *ochraceus* Fieber, 1861	(Lodos & Önder, 1982)
187	*Sciocoris* (*Sciocoris*) *sulcatus* Fieber, 1851	(Kıyak, 1990)
188	*Stagonomus amoenus* Brullé, 1832	(Kıyak, 1990)
189	*Stagonomus bipunctatus bipunctatus* Linnaeus, 1758	(this paper)
190	*Stagonomus devius* Seidenstücker, 1965	(this paper)
191	*Staria lunata* (Hahn, 1835)	(Wagner, 1959)
192	*Tarisa virescens* Herrich-Schäffer, 1851	(Lodos & Önder, 1978)
193	*Tholagmus flavolineatus* (Fabricius, 1798)	(Kıyak, 1990)
194	*Trochiscocoris hemipterus* (Jakovlev, 1879)	(this paper)
195	*Tshingisella bella* Kiritshenko, 1913	(Dioli & Özgen, 2018)
196	*Ventocoris* (*Ventocoris*) *horvathi* (Puton, 1896)	(Dursun & Fent, 2013)
197	*Ventocoris* (*Ventocoris*) *rusticus* (Fabricius, 1781)	(Çerçi et al., 2018)
PYRRHOCORIDAE (3)		
198	*Pyrrhocoris apterus* (Linnaeus, 1758)	(Kıyak, 1990)
199	*Pyrrhocoris marginatus* (Kolenati, 1845)	(Çerçi et al., 2018)
200	*Scantius aegyptius aegyptius* (Linnaeus, 1758)	(Yazıcı et al., 2015)
REDUVIIDAE (13)		
201	*Callistodema fasciata* (Kolenati, 1857)	(this paper)
202	*Coranus* (*Coranus*) *griseus* (Rossi, 1790)	(Çerçi et al., 2018)
203	*Coranus* (*Coranus*) *tuberculifer* Reuter, 1881	(this paper)
204	*Nagusta goedelii* (Kolenati, 1857)	(Çerçi et al., 2018)
205	*Oncocephalus pilicornis* Reuter, 1882	(Çerçi et al., 2018)
206	*Oncocephalus squalidus* (Rossi, 1790)	(Çerçi et al., 2018)
207	*Peirates hybridus* (Scopoli, 1763)	(Özgen et al., 2021)
208	*Reduvius pallipes* Klug, 1830	(Kıyak, 1990)
209	*Reduvius testaceus* (Herrich-Schäffer, 1845)	(Kıyak, 1990)
210	*Rhynocoris* (*Rhynocoris*) *ibericus* Kolenati, 1857	(Kıyak, 1990)
211	*Rhynocoris* (*Rhynocoris*) *iracundus* (Poda, 1761)	(Kıyak, 1990)
212	*Rhynocoris* (*Rhynocoris*) *punctiventris* (Herrich-Schäffer, 1846)	(Kıyak, 1990)
213	*Vachiria deserta* (Becker, 1867)	(Önder, 1980)
RHOPALIDAE (19)		
214	*Agraphopus lethierryi* Stål, 1872	(this paper)
215	*Agraphopus suturalis* Reuter, 1900	(Kıyak, 1990)
216	*Brachycarenus languidus* (Horváth, 1891)	(Kıyak, 1990)

217	*Brachycarenus tigrinus* (Schilling, 1829)	(Pehlivan, 1981)
218	*Chorosoma schillingii* (Schilling, 1829)	(Pehlivan, 1981)
219	*Corizomorpha janowskyi* (Jakovlev, 1883)	(Özgen et al., 2021)
220	*Corizus hyoscyami hyoscyami* (Linnaeus, 1758)	(Kıyak, 1990)
221	*Limacocarenus curtulus* Kiritshenko, 1914	(this paper)
222	*Liorhyssus hyalinus* (Fabricius, 1794)	(Kıyak, 1990)
223	*Maccevethus caucasicus* (Kolenati, 1845)	(Pehlivan, 1981)
224	*Maccevethus corsicus corsicus* Signoret, 1862	(Kıyak, 1990)
225	*Rhopalus* (*Aeschyntelus*) *maculatus* (Fieber, 1837)	(Wagner, 1962)
226	*Rhopalus* (*Rhopalus*) *conspersus* (Fieber, 1837)	(Çerçi et al., 2018)
227	*Rhopalus* (*Rhopalus*) *subrufus* (Gmelin, 1790)	(Kıyak, 1990)
228	*Rhopalus* (*Rhopalus*) *parumpunctatus* Schilling, 1829	(Pehlivan, 1981)
229	*Stictopleurus abutilon* (Rossi, 1790)	(Pehlivan, 1981)
230	*Stictopleurus pictus* (Fieber, 1861)	(Pehlivan, 1981)
231	*Stictopleurus punctatonervosus* (Goeze, 1778)	(Yıldırım et al., 2011)
232	*Stictopleurus subtomentosus* (Rey, 1888)	(Matocq et al., 2014)
RHYPAROCHROMIDAE (24)		
233	*Aphanus rolandri* (Linnaeus, 1758)	(Kıyak, 1990)
234	*Beosus quadripunctatus* (Müller, 1766)	(Matocq et al., 2014)
235	*Beosus maritimus* (Scopoli, 1763)	(Kıyak, 1990)
236	*Emblethis brachynotus* Horváth, 1897	(Kıyak, 1990)
237	*Emblethis griseus* (Wolff, 1802)	(Kıyak, 1990)
238	*Emblethis osmanus* Seidenstücker, 1963	(Yazıcı et al., 2015)
239	*Gonianotus marginepunctatus* (Wolff, 1804)	(Çerçi et al., 2018)
240	*Lasiocoris anomalus* (Kolenati, 1845)	(Kıyak, 1990)
241	*Lasiocoris crassicornis* (Lucas, 1849)	(Kıyak, 1990)
242	*Megalonotus colon* Puton, 1874	(Çerçi et al., 2018)
243	*Megalonotus scaurus* Seidenstücker, 1973	(Seidenstücker, 1973)
244	*Megalonotus sophenus* Seidenstücker, 1973	(Seidenstücker, 1973)
245	*Neurocladus brachiidens* (Dufour, 1851)	(Péricart, 1998b)
246	*Pezocoris apicimacula* (A. Costa, 1853)	(Özgen & Dioli, 2019)
247	*Plinthisus* (*Plinthisus*) *longicollis* Fieber, 1861	(Çerçi et al., 2018)
248	*Proderus bellevoyei* Puton, 1874	(Çerçi et al., 2018)
249	*Raglius confusus* (Reuter, 1886)	(Kıyak, 1990)
250	*Rhyparochromus phoeniceus* (Rossi, 1794)	(Kıyak, 1990)

251	*Rhyparochromus sanguineus* (Douglas & Scott, 1868)	(Çerçi et al., 2018)
252	*Scolopostethus thomsoni* Reuter, 1875	(Matocq et al., 2014)
253	*Tropistethus fasciatus* Ferrari, 1874	(Özgen & Dioli, 2019)
254	*Xanthochilus minusculus* (Reuter, 1885)	(this paper)
255	*Xanthochilus quadratus* (Fabricius, 1798)	(Kıyak, 1990)
256	*Xanthochilus saturnius* (Rossi, 1790)	(Kıyak, 1990)
SCUTELLERIDAE (14)		
257	*Eurygaster austriaca* (Schrank, 1776)	(Brown & Eralp, 1962)
258	*Eurygaster integriceps* Puton, 1881	(Brown & Eralp, 1962)
259	*Eurygaster maura* (Linnaeus, 1758)	(Matocq et al., 2014)
260	*Irochrotus maculiventris* (Germar, 1839)	(Çerçi et al., 2018)
261	*Odontoscelis* (*Odontoscelis*) *dorsalis* (Fabricius, 1798)	(Kıyak, 1990)
262	*Odontoscelis* (*Odontoscelis*) *fuliginosa* (Linnaeus, 1761)	(Kıyak, 1990)
263	*Odontoscelis* (*Odontoscelis*) *litura* (Linnaeus, 1775)	(Matocq et al., 2014)
264	*Odontotarsus impictus* Jakovlev, 1886	(Kıyak, 1990)
265	*Odontotarsus plicatulus* Horváth, 1906	(Kıyak, 1990)
266	*Odontotarsus robustus* Jakovlev, 1884	(Matocq et al., 2014)
267	*Odontotarsus rufescens* Fieber, 1861	(Kıyak, 1990)
268	*Psacasta* (*Cryptodontus*) *tuberculata* (Fabricius, 1781)	(Özgen, 2012)
269	*Psacasta (Psacasta) cypria* Puton, 1881	(Kıyak, 1990)
270	*Psacasta (Psacasta) exanthematica exanthematica* (Scopoli, 1763)	(Kıyak, 1990)
STENOCEPHALIDAE (2)		
271	*Dicranocephalus agilis* (Scopoli, 1763)	(Kıyak, 1990)
272	*Dicranocephalus albipes* (Fabricius, 1781)	(Pehlivan, 1981)
TINGIDAE (21)		
273	*Catoplatus hilaris* Horváth, 1906	(Maral et al., 2013)
274	*Catoplatus horvathi* (Puton, 1878)	(Kıyak, 1990)
275	*Copium adumbratum* (Horváth, 1891)	(this paper)
276	*Copium teucrii* (Host, 1788)	(Lodos & Önder, 1983)
277	*Dictyla echii* (Schrank, 1782)	(Lodos & Önder, 1983)
278	*Dictyla nassata nassata* Puton, 1874	(Maral et al., 2013)
279	*Dictyla rotundata* (Herrich-Schäffer, 1835)	(Lodos & Önder, 1983)
280	*Dictyla triconula* (Seidenstücker, 1954)	(Lodos & Önder, 1983)
281	*Elasmotropis testacea selecta* (Horváth, 1891)	(Lodos & Önder, 1983)
282	*Lasiacantha hedenborgii* (Stål, 1873)	(Maral et al., 2013)
283	*Monosteira lobulifera* Reuter, 1888	(Lodos & Önder, 1983)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

284	*Monosteira unicostata* (Mulsant & Rey, 1852)	(Lodos & Önder, 1983)
285	*Physatocheila confinis* Horváth, 1905	(Maral et al., 2013)
286	*Physatocheila municeps* Horváth, 1903	(Lodos & Önder, 1983)
287	*Stephanitis* (*Stephanitis*) *oschanini* Vasiliev, 1935	(this paper)
288	*Stephanitis* (*Stephanitis*) *pyri* (Fabricius, 1775)	(Lodos & Önder, 1983)
289	*Tingis* (*Tingis*) *angustata* (Herrich-Schäffer, 1838)	(Maral et al., 2013)
290	*Tingis* (*Tingis*) *auriculata* (A. Costa, 1847)	(Maral et al., 2013)
291	*Tingis* (*Tropidocheila*) *ciliaris* (Puton, 1879)	(Péricart, 1983)
292	*Tingis* (*Tingis*) *grisea* Germar, 1835	(Maral et al., 2013)
293	*Tingis* (*Tropidocheila*) *hellenica hellenica* (Puton, 1877)	(Maral et al., 2013)

DISCUSSION

Heteroptera fauna of Elazığ was studied by native and foreign researchers since the beginning of 1950s. Although these studies and the current one reported a total of 293 Heteroptera species, this number most possibly underestimates the true diversity of Heteroptera fauna of Elazığ. Due to its geographical location, Elazığ seems to be a meeting point for European species at their eastern margin of distribution and Central Asian and Turanian species at their western margin of distribution. *Adelphocoris vandalicus, Acetropis* (*Acetropis*) *carinata, Deraeocoris* (*Deraeocoris*) *trifasciatus*, *Icodema infuscata, Carpocoris* (*Carpocoris*) *melanocerus* and *Eurygaster austriaca* are some examples for such European species whereas *Camptopus tragacanthae*, *Stenodema* (*Stenodema*) *turanica*, *Prostemma* (*Prostemma*) *guttula asiaticum*, *Aelia alticola*, *Tshingisella bella* and *Limnacocarnus curtulus* are some examples for such Central Asian and Turanian species. As demonstrated in this study, a short field research conducted in several localities in a few days could easily allow us to discover more than a dozen new species for the fauna of Elazığ and a new species for the fauna of Turkey. It will not be surprising if a more extensive field research focused on many localities in Elazığ gives birth to many new discoveries for the region, the country and even for science.

ACKNOWLEDGEMENTS

We are thankful to Serdar Tezcan (İzmir, Turkey) for providing many of the literature that were essential for the preparing of the checklist. We also thank Vladimir Gnezdilov (St. Petersburg, Russia) for the accompaniment in the field. We also thank Paride Dioli (Milano, Italy) and an anonymous reviewer for the critical revision of the manuscript.

REFERENCES

Belousova, E. N., 1999, Revision of Shield Bugs of the Genus *Agatharchus* Stål (Heteroptera, Pentatomidae), *Entomologicheskoe Obozrenie*, 75 (4): 836–856. [in Russian]

Brown, E. S., Eralp, M., 1962, The distribution of the species of Eurygaster Lap. (Hemiptera, Scutelleridae) in Middle East countries, *Annals and Magazine of Natural History*, Serial 13, vol. V: 65–81.

Bolu, H., Özgen, İ. & Fent, M., 2006, The Investigations on Almond Pentatomidae (Heteroptera) Fauna in Diyarbakır, Elazığ and Mardin Province, *Yüzüncü Yıl Üniversitesi, Ziraat Fakültesi, Tarım Bilimleri Dergisi*, 16(1): 25–28.

Çağatay, N., 1985, Türkiye Oxycareninae (Heteroptera-Lygaeidae) alt familyasının taksonomisi ve erkek genital organının önemi üzerine çalışmalar, *Bitki Koruma Bülteni*, 25(1-2): 18–29.

Çerçi, B., Özgen, I., Dioli, P., 2018, Additional faunistic Notes on Heteroptera (Hemiptera: Insecta) in East Anatolia

(Turkey), *Journal of Entomology & Zoology Studies*, 6(1): 1225–1231.

Çerçi, B. Tezcan, S., Özgen, I., 2020, Review of Reuteria Puton, 1875 (Heteroptera: Miridae) species present in Lodos Entomological Museum, Turkey (LEMT), *Zootaxa,* 4878 (1): 159–168.

Dioli, P., Özgen, İ., 2019, A Rare and Less Known Pentatomidae in Turkey: *Tshingisella bella* Kiritshenko, 1913, *International Journal of Fauna and Biological Studies*, 5(3): 17–18.

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.

Ghahari, H., Moulet, P., Linnavuori, R. E., Ostovan, H., 2012, An annotated catalogue of the Iranian Coreidae, Rhopalidae, and Stenocephalidae (Hemiptera: Heteroptera: Pentatomomorpha: Coreoidea), *Zootaxa*, 3519: 1–31.

Ghauri, M.S.K., 1978, Notes on the Miridae (Heteroptera) from India and Pakistan, *Türkiye Bitki Koruma Dergisi*, 2(3): 125–144.

Göllner-Scheiding, U., 1978, Bemerkungen zu der Gattung *Rhopalus* Schilling einschliesslich *Brachycarenus* Fieber (Heteroptera, Rhopalidae), *Mitteilungen aus dem Zoologischen Museum in Berlin*, 54: 313–331.

Henry, T. J., 2017, *Biodiversity of Heteroptera*, 279–335 pp. In: *Insect Biodiversity* (Eds. R. G. Foottit & P.H. Adler), Science and Society, Vol. I, Second edition. Wiley-Blackwell, Oxford.

Hoberlandt, L., 1952, Results of the zoological scientific expedition of the National Museum in Praha to Turkey. 2. Hemiptera-Heteroptera I. The aquatic and semi-aquatic Heteroptera of Turkey, *Acta Entomologica Musei Nationalis Pragae*, 26(352): 1–74.

Hosseini, R., 2014, A study on the genus *Orthops* Fieber (Hemiptera: Miridae: Mirinae) in Iran, *Arthropods*, 3(1): 57–69.

Kerzhner, I. M., Josifov M.,1999, *Miridae Hahn, 1833* 1–576 pp. In: *Catalogue of the Heteroptera of the Palaearctic Region. Vol. 1, Enicocephalomorpha, Dipsocoromorpha, Nepomorpha, Gerromorpha and Leptopodomorpha* (Eds. B. Aukema & C. Rieger). The Netherlands Entomological Society, Amsterdam.

Kıyak, S., 1990, Systematisch - Oekologische Untersuchungen Ueber die Wanzen (Insecta: Heteroptera) Aus dem Gebiet Hazar - See, Maden und Ergani (Prov. Elazig)-I, *J. Biol. Fac. Sci. Arts Gazi Univ.*, 1: 43–95.

Kıyak, S., 1990, Systematisch - Oekologische Untersuchungen Ueber die Wanzen (Insecta: Heteroptera) Aus dem Gebiet Hazar - See, Maden und Ergani (Prov. Elazig)-II. *J. Biol. Fac. Sci. Arts Gazi Univ.*, 1: 97–144.

Kiritshenko, A. N., 1918, Hemiptera-Heteroptera faunae Caucasiae. 1, *Mémoires du Musée du Caucase (A)*, 6: 1–177.

Linnavuori, R.E., 2000. On the genus Phytocoris Fallén (Heteroptera: Miridae, Mirinae) in Iran with remarks on species of the adjacent countries. Part II, *Acta Universitatis Carolinae, Biologica*, 44: 73–109.

Lodos, N., Önder, F., 1978, Türkiye Pentatomoidea (Heteroptera) üstfamilyası üzerinde araştırmalar. II. familya: Plataspidae Dall., *Türkiye Bitki Koruma Dergisi*, 2 (4): 195–239.

Lodos, N., Önder, F., 1980, Türkiye Pentatomoidea (Heteroptera) üst familyası üzerinde araştırmalar. III. Familya: Cydnidae Billberg, *Ege Üniversitesi: Ziraat Fakültesi Yayınları*, No. 381, 81 pp.

Lodos, N., Önder, F., 1982, Contribution to the study of the Turkish Pentatomoidea (Heteroptera). V. Sciocorini Bergroth (Pentatomidae), *Türkiye Bitki Koruma Dergisi*, 6: 133–146.

Lodos, N., Önder, F., 1983, Preliminary List of Tingidae with Notes on Distribution and Importance of Species in Turkey, *Ege Üniversitesi Ziraat Fakültesi Yayınları*, 449, 51 pp.

Maral, H., Ulusoy, M.R., Bolu, H. & Guilbert, E., 2013, Faunistic studies on Tingidae (Hemiptera) species of Diyarbakır, Mardin and Elazığ provinces, *Turkish Bulletin of Entomology*, 3(4): 139–155.

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 and Zoology,* 9: 884–930.

Önder, F., 1976, Türkiye Miridae (Hemiptera)

faunası üzerinde sistematik çalışmalar. Ege Üniversitesi Ziraat Fakültesi, Entomoloji ve Zirai Zooloji Kürsüsü, Doçentlik Tezi, İzmir, 506 s.

Önder, F., 1980, The first list of Family Reduviidae (Heteroptera) of Turkey, *Ege Üniversitesi Ziraat Fakültesi Dergisi*, 17(1): 1–20.

Önder, F., 1982, Türkiye Anthocoridae (Heteroptera) Faunası Üzerinde Taksonomik ve Faunistik Araştırmalar, *Ege Üniversitesi, Ziraat Fakültesi Yayınları*, No. 459, 159 pp.

Önder, F., Karsavuran, Y., Tezcan, S., Fent, M., 2006, *Heteroptera (Insecta) Catalogue of Turkey*, META Press, İzmir, vi + 164 pp.

Özgen, I., 2012, The species of suborder Heteroptera (Hemiptera) on vineyards agroecosystems which found in Diyarbakır, Elazığ & Mardin provinces, Turkey, *Munis Entomology & Zoology*, 7(1): 255–258.

Özgen, I., Dioli, P., 2018, A new and interesting record on Miridae (Hemiptera) Fauna of Turkey: *Megacoelum quercicola* Linnavuori, 1965, *International Journal of Fauna and Biological Studies*, 5(4): 104–105.

Özgen, I., Dioli, P., 2019, Contribution to the knowledge of Lygaeidae and Miridae (Hemiptera: Heteroptera) in East Anatolia, *Journal of Heteroptera of Turkey*, 1(1–2): 25–32.

Özgen, İ., Gözüaçık, C., Karsavuran, Y., Fent, M., 2005, 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.

Özgen, İ., Çerçi, B., Dioli, P., 2018, Some Rare Species of Heteroptera (Hemiptera) from Turkey, *International Journal of Fauna and Biological Studies,* 5(1): 24–26.

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.

Pehlivan, E., 1981, Türkiye Stenocephalidae, Rhopalidae ve Alydidae (Heteroptera: Coreoidea) Faunası Üzerinde Sistematik Araştırmalar, *Ege Üniversitesi Ziraat Fakültesi Yayınları*, No. 410, 189 pp.

Péricart, J., 1983, *Hémiptères Tingidae Euro-Méditerranéens*, Faune de France 69, Fédération Française des Sociétés de Sciences Naturelles, Paris, 618 pp.

Péricart, J., 1984, *Hémiptères Berytidae*, Faune de France, 70, Fédération Française des Sociétés de Sciences Naturelles, Paris, 172 pp.

Péricart, J., 1998a, *Hémiptères Lygaeidae euro-méditerranéens, volume 1*, Faune de France. Vol. 84B. Fédération Française des Sociétés de Sciences Naturelles, Paris, 475 pp.

Péricart, J., 1998b, *Hémiptères Lygaeidae euro-méditerranéens, volume 2*, Faune de France. Vol. 84B. Fédération Française des Sociétés de Sciences Naturelles, Paris, 453 pp.

Ribes, J., Pagola-Carte, S., 2013, *Hémiptères Pentatomoidea Euro-Méditerranéens, volume 2*, Faune de France 96, Fédération Française des Sociétés de Sciences Naturelles, Paris, 425 pp.

Ribes, J., Pagola-Carte, S., Zabalegui, I., 2008, On some Palaearctic Carpocorini (Hemiptera: Pentatomidae: Pentatominae), *Heteropterus Revista de Entomología,* 8 (2): 155–169.

Seidenstücker, G., 1973, Zwei neue Landwanzen aus der Türkei (Hemiptera-Heteroptera, Lygaeidae), *Mitteilungen der Münchner Entomologischen Gesellschaft*, 63: 185–193.

Seidenstücker, G., 1975. Über anatolischen Schildwanzen, *Reichenbachia*, 15: 259–268.

Tezcan, S., 2020, Analysis of the insect fauna of Turkey and suggestions for future studies, *Munis Entomology & Zoology*, 15 (2): 690–710.

Tuatay, N., Gül, S., Demirtola, A., Kalkandelen A., Çagatay, N., 1967, *Nebat Koruma Müzesi Böcek Kataloğu (1961-1966)*, Ayyıldız Matbaası, Ankara, 66 pp.

Tuatay, N., Kalkandelen, A. & Aysev, N., 1972, *Nebat Koruma Müzesi Böcek Kataloğu (1961- 1971)*, Yenigün Matbaası, Ankara, 119 pp.

Wagner, E., 1959, Beitrag zur Heteropterenfauna Anatoliens, *Zeitschrift für Angewandte Entomologie*, 44: 102–113.

Wagner, E., 1962, *Rhopalus maculatus decolor* nov. subsp. (Hem. Het. Rhopalidae), *İstanbul Üniversitesi Fen Fakültesi Mecmuasi (B)*, 27(1-2): 15–16.

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

Yazıcı, G., Yıldırım, E., Moulet, P., 2015, Contribution to the knowledge of the Lygaeoidea (Hemiptera, Heteroptera) fauna of Turkey, *Linzer Biologische Beiträge*, 47(1): 969–990.

Yazıcı, G., Yıldırım, E., 2017, New and Interesting Records of *Orthops* Fieber 1858 (Hemiptera: Heteroptera: Miridae) in Turkey, *Acta Entomologica Serbica*, 22: 1–14.

Yıldırım, E., Yazıcı, G., Linnavuori, R. E., 2011, Contribution to the knowledge of Alydidae, Coreidae, Rhopalidae and Stenocephalidae (Coreoidea: Heteroptera: Hemiptera) fauna of Turkey, *Linzer Biologische Beiträge*, 43(2): 1625–1639.

Yıldırım, E., Yazıcı, G. Ramaza, K., Moulet, P., 2013, Contribution to the Knowledge of the Anthocoridae, Lyctocoridae, Nabidae, Reduviidae and Tingidae (Hemiptera, Heteroptera) Fauna of Turkey, *Turkish Journal of Entomological Research Society*, 15(3): 53–66.

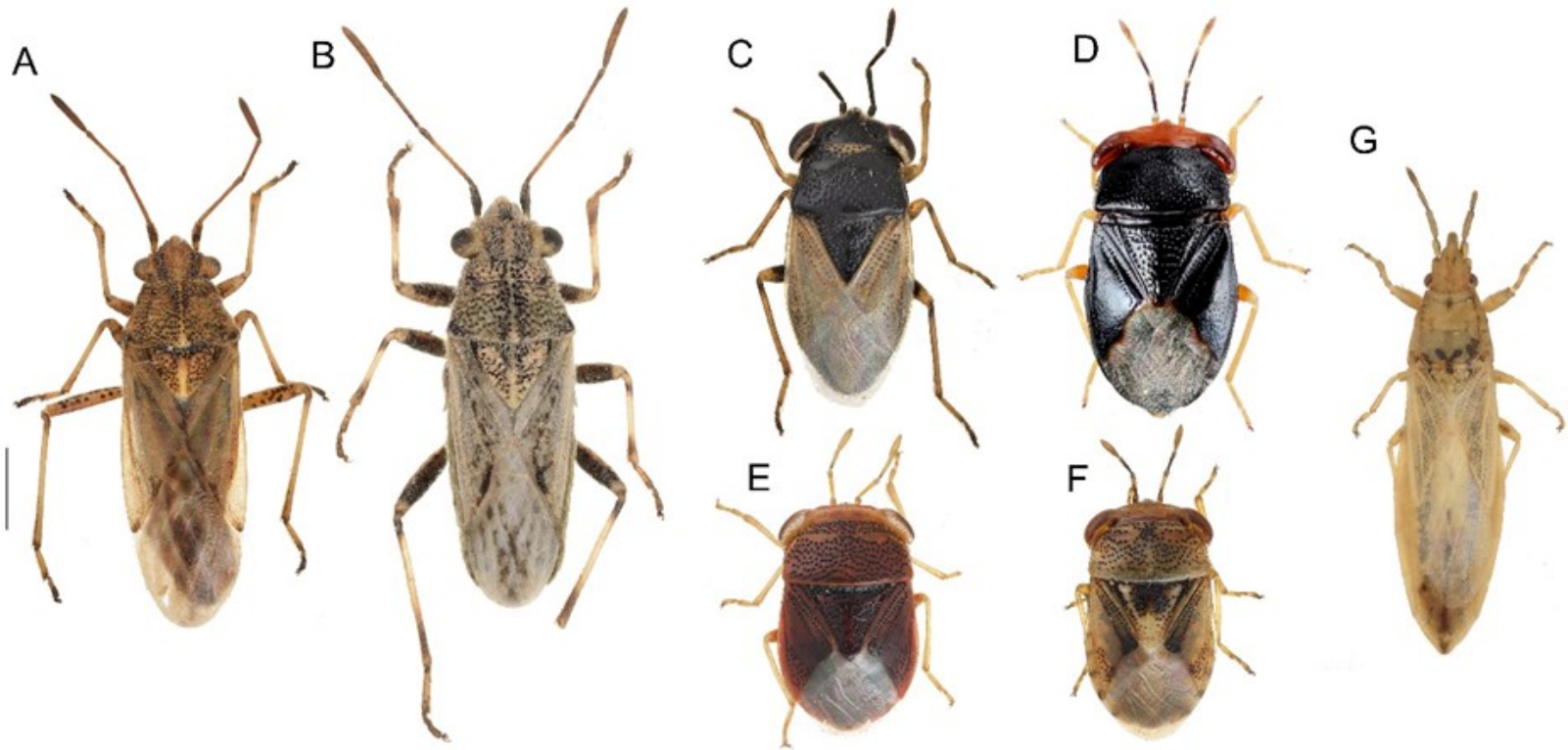


Figure 1A–G. A– *Nysius helveticus* (Herrich-Schäffer, 1850), **B**– *Ortholomus carinatus* (Lindberg, 1932), **C**– *Geocoris* (*Geocoris*) *pubescens* (Jakovlev, 1871), **D**– *Geocoris* (*Piocoris*) *erythrocephalus erythrocephalus* (Lepelletier & Serville, 1825), **E**– *Geocoris* (*Piocoris*) *putonianus* Bergroth, 1892, **F**– *Geocoris* (*Piocoris*) *luridus luridus* (Fieber, 1844), **G**– *Cymophyes ochroleuca* Fieber, 1870. (Scale bar 1 mm)

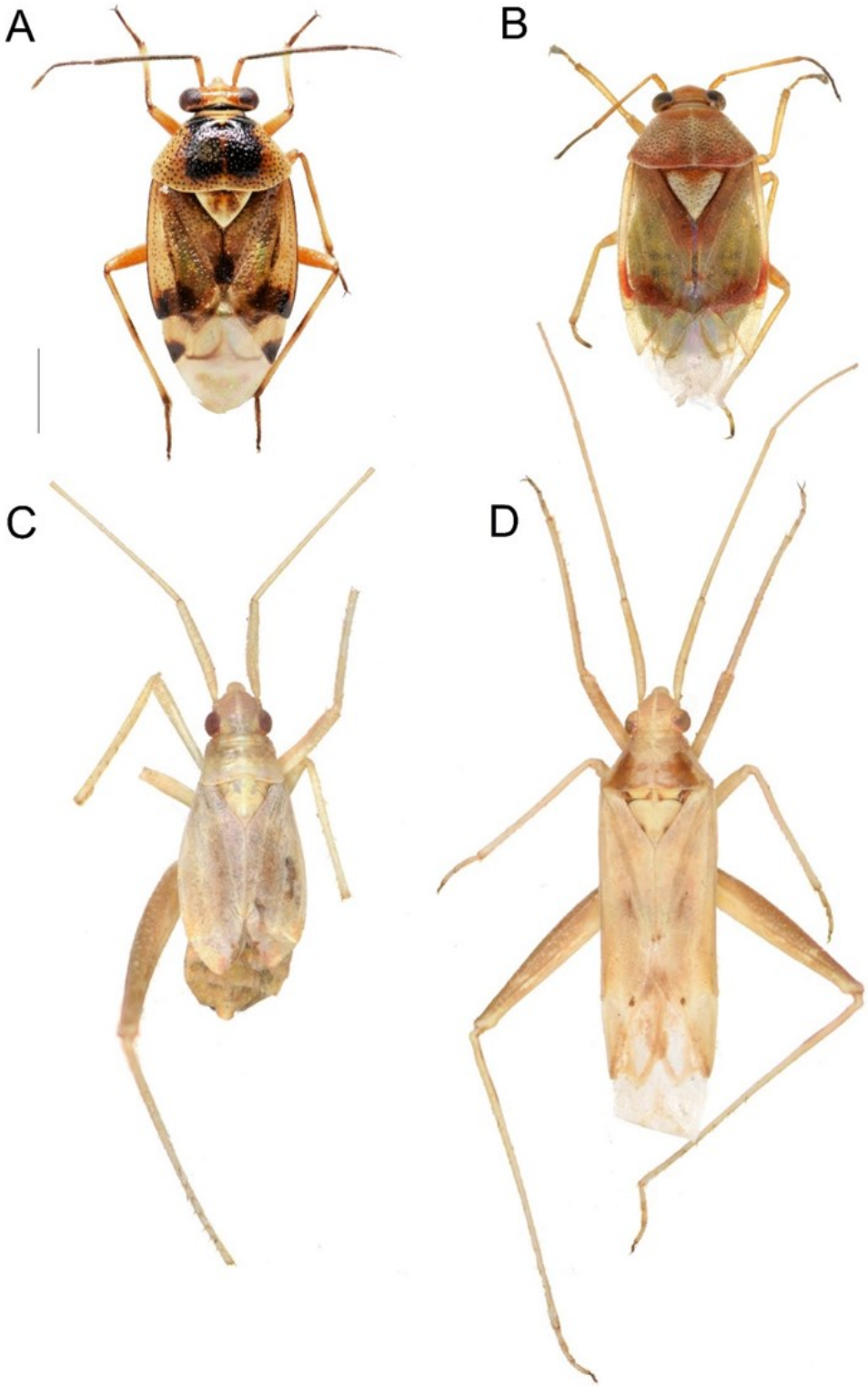


Figure 2A–D. A– *Deraeocoris* (*Camptobrochis*) *serenus* (Douglas & Scott, 1868), **B**– *Orthops* (*Montanorthops*) *pilosulus* Jakovlev, 1877, **C**– *Phytocoris* (*Eckerleinius*) *niveatus* Horváth, 1891, female, **D** – *idem,* male. (Scale bar 1 mm)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

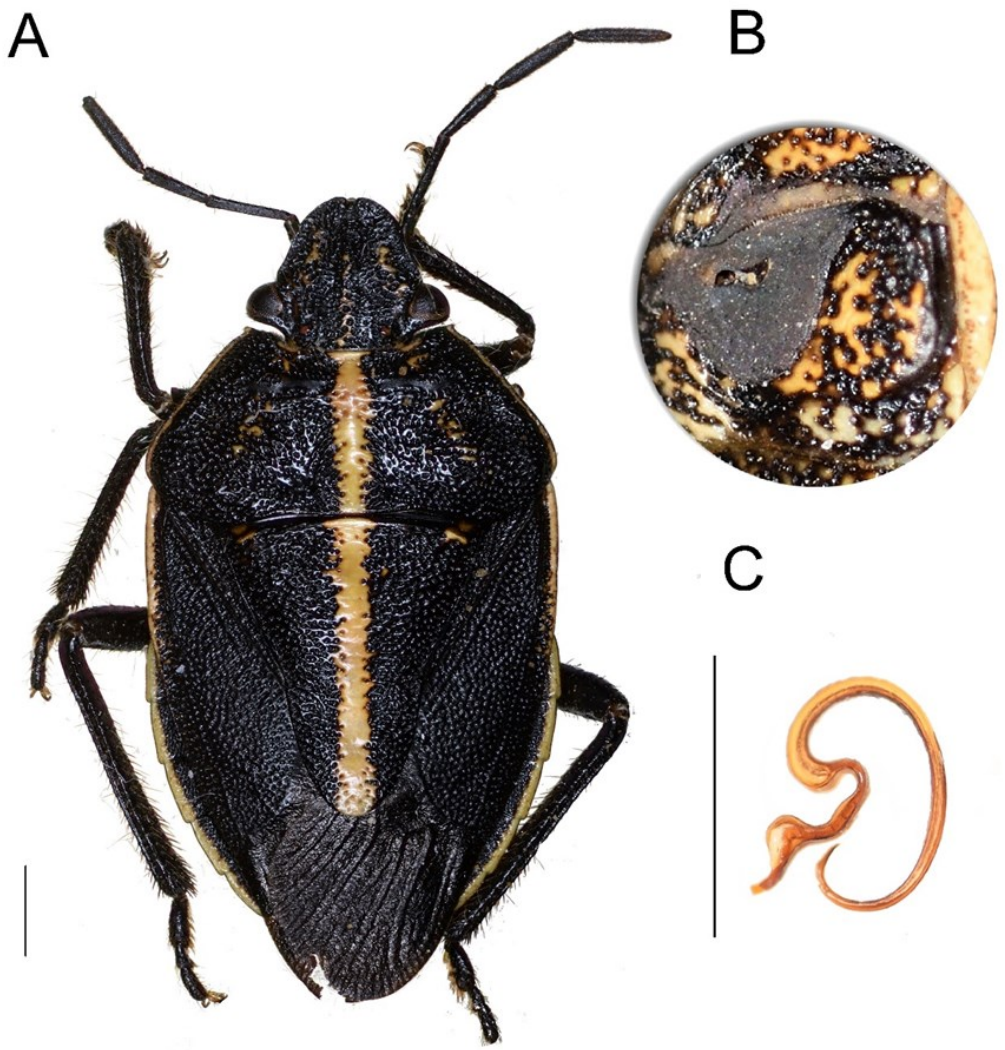


Figure 3A–C. A– *Agatharchus* (*Agatharchus*) *ponticus* Belousova, 1999, dorsal habitus, male, **B**– *idem*, evaporatory area of scent gland, **C**– *idem*, vesica. (Scale bars 1 mm)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

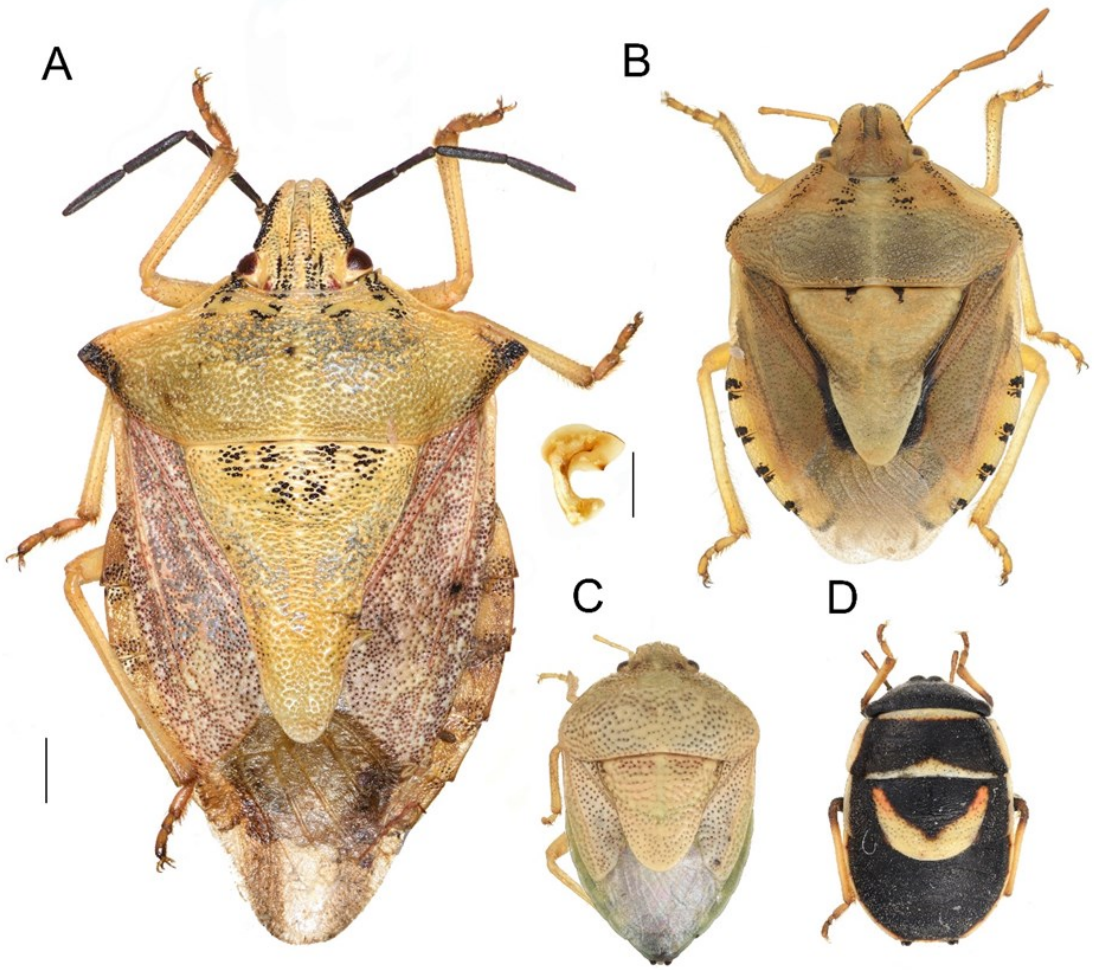


Figure 4A–D. A– *Carpocoris* (*Carpocoris*) *coreanus* Distant, 1899, its paramere next to it (Scale bar of the paramere 0.5 mm), **B**– *Antheminia lunulata* (Goeze, 1778), **C**– *Stagonomus devius* Seidenstücker, 1965, **D**– *Trochiscocoris hemipterus* (Jakovlev, 1879). (Scale bar 1 mm)

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

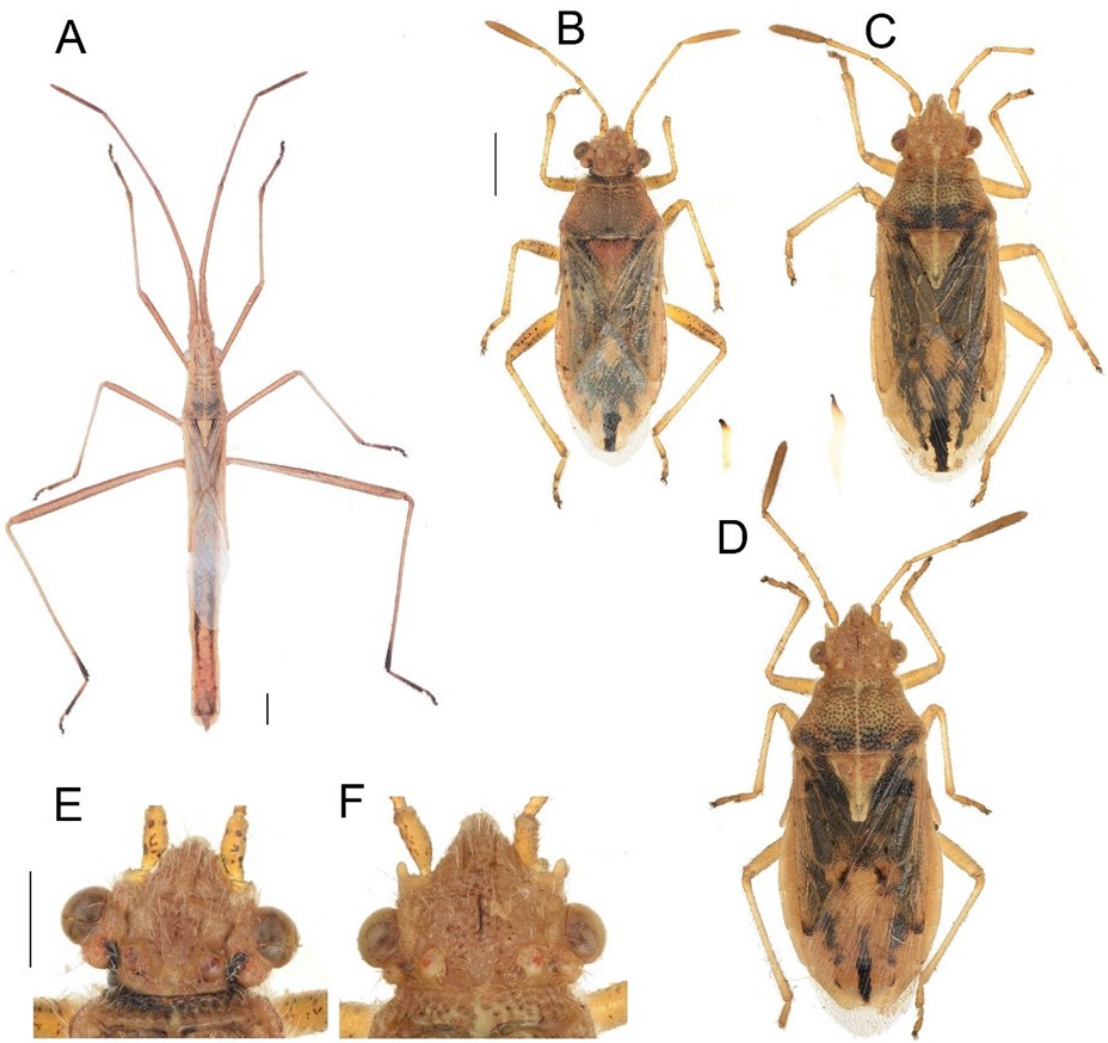


Figure 5A–D. A– *Chorosoma schillingii* (Schilling, 1829), (Scale bar 1 mm), **B**– *Rhopalus* (*Rhopalus*) *parumpunctatus* Schilling, 1829, male with left paramere, **C**– *Limacocarenus curtulus* Kiritshenko, 1914, male with left paramere, **D**– *idem,* female, (Scale bar 1 mm), **E** – *Rhopalus* (*Rhopalus*) *parumpunctatus* Schilling, 1829, head, **F** – *Limacocarenus curtulus* Kiritshenko, 1914, head, (Scale bar 0.5 mm).

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

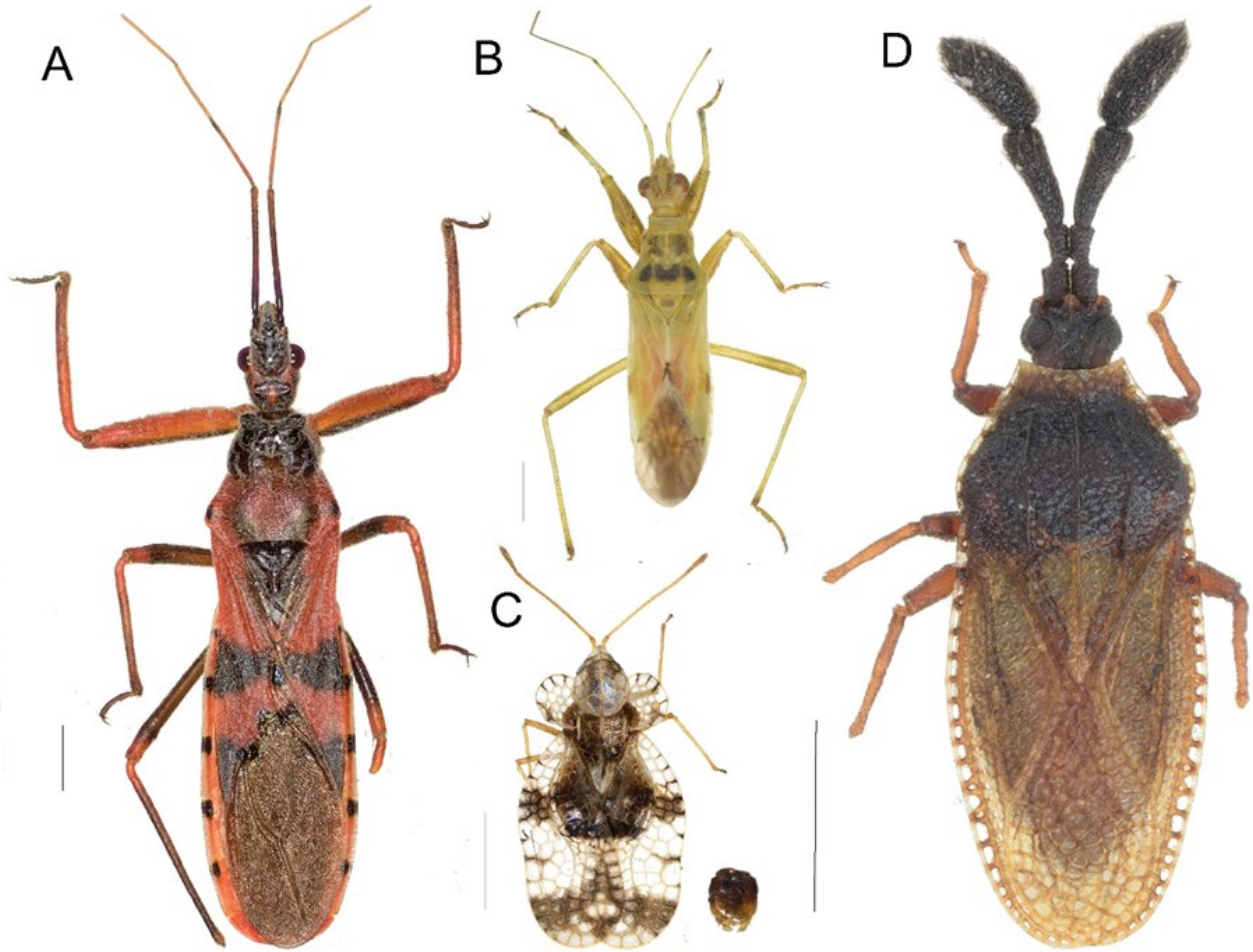


Figure 6A–D. **A**– *Callistodema fasciata* (Kolenati, 1857), **B**– *Nabis* (*Aspilaspis*) *viridulus* Spinola, 1837, **C**– *Stephanitis* (*Stephanitis*) *oschanini* Vasiliev, 1935 (with pygophore), **D** - *Copium adumbratum* (Horváth, 1891). (Scale bars 1 mm)

JHT
J.Het.Turk.
Journal of the Heteroptera of Turkey
ISSN 2687 - 3249 (online edition)
May, 2021
Volume 3, Issue 1

Research Article

New records of Pentatomidae (Hemiptera: Heteroptera) for the fauna of Kosovo

Devrim BAYMAK[1] Suat KIYAK[2]

[1]National Institute of Public Health of Kosova, 10000 Nëna Tereze, Pristina, KOSOVA

[2]Gazi Universty, Faculty of Arts and Sciences, Department of Biology, 06500 Teknikokullar, Ankara, TURKEY

E-mail: skiyak@gazi.edu.tr ORCID iD: 0000-0001-8167-8283

ABSTRACT: The samples in this study, in which 6 new species from the Pentatomidae (Hemiptera: Heteroptera) family were recorded, were collected in several field studies conducted in different provinces of Kosovo in 2011-2012.

These newly recorded species for the fauna of Kosovo are: *Carpocoris mediterraneus* (Tamanini, 1958) *Codophila varia* (Fabricius 1787) *Antheminia varicornis* (Jakovlev, 1874) *Eurydema ventralis* Kolenati 1846 *Ancyrosoma leucogrammes* (Gmelin 1790) *Tholagmus flavolineatus* (Fabricius 1798).

Also the distribution of each species were showed on the map.

KEYWORDS: Heteroptera, fauna, Kosovo, Pentatomidae, new records.

To cite this article: Baymak, D., Kıyak, S., 2021, New records of Pentatomidae (Hemiptera: Heteroptera) for the fauna of Kosovo, *J.Het.Turk.*, 3 (1):76-80

DOI:10.5281/zenodo.4841107

To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A8.pdf

Received: Feb 2, 2021; **Revised:** Apr 20, 2021; **Accepted:** Apr, 21, 2021; **Published online:** May 31, 2021

INTRODUCTION

Suborder Heteroptera (Hemiptera) are represented by 9365 species and 246 subspecies belong to 1632 genera in the Palearctic region (Aukema et al., 2013).

According to Rieder (2006), "the family Pentatomidae is the largest in the Pentatomoidea, presently containing over 4700 species in nearly 900 genera. Its members occur worldwide, and are especially diverse in both Old World and New World tropics." and "numbers of Palaearctic Pentatomidae (Heteroptera) are 219 genera, 841 species and 19 subspecies".

The known fauna of Heteroptera species in Kosovo is usually based on several studies on 19 and 20-century studies, and we have given the literature information about these studies in our previosly Baymak & Kıyak (2019- 2020) studies.

MATERIAL AND METHODS

A total of 58 adult specimens of six species were collected from 12 locations

of Kosovo In July and August 2011-2012. (Figure 1 and Table 1).

The specimens were collected by insect trap and killed in 70% alcohol jars and were prepared based on technical and standards of data collection of the zoology museum.

The samples were determined using identification keys by Stichel (1957-1962) and Bei-Bienko (1964).

In Table 2 was given the provinces of Kosovo where new faunistic records of six species belonging to Pentatomidae collected and recorded. (Table 2).

The distribution of the species is marked on the map (Figure 1). All samples are deposited in the collection of the Zoological Museum of Gazi University (ZMGU), Ankara, Turkey.

RESULTS

New recorded data on Heteroptera fauna of Kosovo are as follows:

Family: Pentatomidae Leach, 1815

Genus: *Carpocoris* Kolenati, 1846

***Carpocoris mediterraneus* Tamanini, 1958**

Material examined:

Lok. D1, Prizren (Lokvica) 42°10'6.N, 20° 47'46.E, 700-900 m, 21.07.2011; 6♀♀, 5♂♂;

Lok. D3, Prizren (Sredska) 42°10'30.N, 20°51'21.E, 750-850 m, 24.07.2012; 1♀;

Lok. D2, Prizren (Vırmica) 42° 9'55.N, 20° 33'45.E, 270-320 m, 04.07.2012; 17♀♀, 3♂♂.

Genus: *Codophila* Mulsant & Rey, 1866

***Codophila varia* (Fabricius, 1787)**

Material examined:

Lok. D5, Gjakova (Radonic) 42°28'7.N 20° 25'32.E, 450-500 m, 29.07.2012; 1♂;

Lok. D2, Prizren (Vırmica) 42° 9'55.N, 20° 33'45.E, 270-320 m, 04.07.2012; 1♀;

Lok. D4, Prizren (Pousko) 42° 9'13.N 20° 47'28.E, 900-1200 m, 22.07.2012; 1♀.

Genus: *Antheminia* Mulsant & Rey, 1866

***Antheminia varicornis* (Jakovlev, 1874)**

Material examined:

Lok. D7, Prizren (Prevalac) 42° 9'42.N 20° 54'42.E, 1200-1500 m, 24.07.2012; 3♀♀;

Lok. D6, Prizren (Musnikova) 42°10'36.N 20°54'31.E, 950-1000 m, 24.07.2012; 1♀;

Lok. D8, Dragas (Brod) 42° 0'2.N 20° 41'28.E, 1000-15000 m, 30.07.2012; 1♀.

Genus: *Eurydema* Laporte 1833

***Eurydema ventralis* Kolenati, 1846**

Material examined:

Lok. D8, Dragas (Brod) 42° 0'2.N 20° 41'28.E, 1000-15000 m, 30.07.2012; 1♀;

Lok. D4, Prizren (Pousko) 42° 9'13.N 20° 47'28.E, 900-1200 m, 22.07.2012; 4♀♀;

Lok. D9, Pristina (Germia) 42°40'3.N 21° 13'38.E 700-1000 m, 22.07.2012; 1♀.

Genus: *Ancyrosoma* Amyot & Serville, 1843

***Ancyrosoma leucogrammes* (Gmelin, 1790)**

Material examined:

Lok. D9, Pristina (Germia) 42°40'3.N 21° 13'38.E m, 700-1000 m 22.07.2012; 2♀♀, 4♂♂;

Lok. D10, Stripce 42°15'57.N 21° 6'21.E 650-750 m, 28.07.2012; 1♀;

Lok. D5, Gjakova (Radonic) 42°28'7.N 20° 25'E 450-500 m, 29.07.2012; 1♀;

Lok. D11, Shtime (Belaj) 42°26'14.N 21° 1'23.E 600-650 m, 25.07.2012; 1♀;

Lok. D12, Suvareka 42°22'58.N 20° 52'2.E 600-650 m, 27.08.2012; 2♀♀.

Genus: *Tholagmus* Stål, 1860

***Tholagmus flavolineatus* (Fabricius, 1798)**

Material examined:

Lok. D4, Prizren (Pousko) 42° 9'13.N 20° 47'28.E 900-1200 m, 22.07.2012; 3♀♀.

Figure 1. Study area and localities Pentatomidae (D1-D12) at the Republic of Kosovo

J.Het.Turk., 3(1), May 2021 (eISSN 2687-3249)

Table 1. Sampling localities of Heteroptera specimens from Kosovo. Geographical coordinates, sampling date.

Loc.no:	Province	Cordinates	Altutide (m)	Sampling Date
D1	Prizren (Lokvica)	42°10'6.N 20°47'46.E	700-900	21.07.2011
D2	Prizren (Vırmica)	42° 9'55.N 20°33'45.E	270-320	04.07.2012
D3	Prizren (Sredska)	42°10'30.N 20°51'21.E	750-850	24.07.2012
D4	Prizren (Pousko)	42° 9'13.N 20°47'28.E	900-1200	22.07.2012
D5	Gjakova (Radonic)	42°28'7.N 20°25'32.E	450-500	29.07.2012
D6	Prizren (Musnikova)	42°10'36.N 20°54'31.E	950-1000	24.07.2012
D7	Prizren (Prevalac)	42° 9'42.N 20°54'42.E	1200-1500	24.07.2012
D8	Dragas (Brod)	42° 0'2.03N 20°41'28.E	1000-1500	30.07.2012
D9	Pristina (Germia)	42°40'3.N 21°13'38.E	700-1000	22.07.2012
D10	Stripce	42°15'57.N 21° 6'21.E	650-750	28.07.2012
D11	Sthime (Belaj)	42°26'14.N 21° 1'23.E	600-650	25.07.2012
D12	Suvareka	42°22'58.N 20°52'2.E	600-650	27.08.2012

Table 2. Heteropteran species recorded from Kosovo provinces.

Province	The name of Species
Prizren (Lokvica)	*Carpocoris mediterraneus* (Tamanini, 1958)
Prizren (Vırmica)	*Codophila varia* (Fabricius 1787) *Carpocoris mediterraneus* (Tamanini, 1958)
Prizren (Sredska)	*Carpocoris mediterraneus* (Tamanini, 1958)
Prizren (Lokvica)	*Codophila varia* (Fabricius 1787) *Eurydema ventralis* Kolenati 1846 *Tholagmus flavolineatus* (Fabricius 1798)
Gjakova (Radonic)	*Codophila varia* (Fabricius 1787) *Ancyrosoma leucogrammes* (Gmelin 1790)
Prizren (Musnikova)	*Antheminia varicornis* (Jakovlev, 1874)
Prizren (Prevalac)	*Antheminia varicornis* (Jakovlev, 1874)
Dragas (Brod)	*Eurydema ventralis* Kolenati 1846 *Antheminia varicornis* (Jakovlev, 1874)
Pristina (Germia)	*Eurydema ventralis* Kolenati 1846 *Ancyrosoma leucogrammes* (Gmelin 1790)
Stripce	*Eurydema ventralis* Kolenati 1846 *Ancyrosoma leucogrammes* (Gmelin 1790)
Shtime (Belaj)	*Ancyrosoma leucogrammes* (Gmelin 1790)
Suvareka	*Ancyrosoma leucogrammes* (Gmelin 1790)

CONCLUSION

In this study, 58 adult specimens were collected belonging to Pentatomidae (Hemiptera: Heteroptera).

These are identified as six species of *Carpocoris mediterraneus* (Tamanini, 1958), *Codophila varia* (Fabricius, 1787), *Antheminia varicornis* (Jakovlev, 1874), *Eurydema ventralis* Kolenati, 1846, *Ancyrosoma leucogrammes* (Gmelin 1790) and *Tholagmus flavolineatus* (Fabricius 1798) new records for the Heteroptera fauna of Kosovo. These species were recorded from follows Kosovo provinces: Prizren, Pristina, Shtime, Gjakova, Strpce Suvareka for the first time (Table.2)

A total of 228 Heteroptera species have been recorded as a result of the examination of previous studies in Kosovo (Baymak & Kıyak, 2020). With this 6 new records published yet, the number of species belonging to the fauna of Heteroptera in Kosovo reached 234 species.

REFERENCES

Baymak D. and Kıyak S., 2019, Six new records for the Heteroptera (Hemiptera) fauna of Kosovo, *J. Het. Turk.,* 1(1-2),:20-24pp.

Baymak D. and Kıyak S., 2020, Seven new records for the Heteroptera (Hemiptera) fauna of Kosovo, *J. Het. Turk.,* 2(1):3-8pp

Rider, D. A., 2006, *Family Pentatomidae*. Pp. 233-402, in: Aukema, B. and C. Rieger (eds.), *Catalogue of the Heteroptera of the Palaearctic Region.* Vol. 5. The Netherlands Entomological Society, Amsterdam.

Aukema, B., Rieger, C., Rabitsch, W.,2013, *Catalogue of the Heteroptera of the Palaearctic Region.* Vol. 6. Supplement. Netherlands Entomological Society, Wageningen, xxiii + 653 pp.

Bei-Bienko, G. Ya., 1964, *Hemiptera* in *Keys to the Insects of the European Ussr*, Academy of Sciences of the USSR. Zoological Institute Moskova, 1: 852-1118.

Stichel, W., 1957-1962, *IIIustrierte Bestimmungstabellen der Wanzen II. Europa (Hemiptera-Heteroptera Europae)*, Hermsdorf, Berlin, 4: 1-830.

JHT
J.Het.Turk.
Journal of the Heteroptera of Turkey
ISSN 2687 - 3249 (online edition)
May, 2021
Volume 3, Issue 1

Research Article

The Some Lygaeidae (Hemiptera: Heteroptera) Family Species by Collected by Light Traps in Western Turkey

İnanç ÖZGEN[1] Semih ÖRGEL[2] Ayşenur TAN[3]

[1] Fırat University, Engineering Faculty, Bioengineering Department, Elazığ, TURKEY

[2] Celal Bayar University, Demirci Vocational School, TR-45600, Demirci, Manisa, TURKEY

[3] Sakarya University of Applied Sciences, Pamukova Vocational School, Department of Landscape and Ornamental Plants, Sakarya, TURKEY

Corresponding author E-mail: inancozgen@gmail.com

ABSTRACT: This study was carried out between 2013 to 2017 years in Western Turkey. The species were collected by light traps. Totally; The seven species were recorded in Lygaeidae Family. These are: *Remaudiereana annulipes* (Barensprung, 1859), *Eremocoris abietis* (L.,1758), *Beosus quadripunctatus* (Müller, 1766), *Nysius cymoides* (Spinola, 1837), *Lamprodema maura* (Fab., 1803), *Metopoplax origani* (Kolenati, 1845) *Camptocera glaberrima* (Walker, 1872). All of specimens were faunistically important for their fauna.

KEYWORDS: Lygaeidae, Western Turkey, New Faunistic Records.

To cite this article: Özgen, İ., Örgel, S., Tan, A., 2021, The Some Lygaeidae (Hemiptera: Heteroptera) Family Species by Collected by Light Traps in Western Turkey, *J..Het.Turk.*, 3 (1):81-83
DOI:10.5281/zenodo.4841114
To link to this article: https://www.j-ht.org/wp-content/uploads/2021/05/V31-A9.pdf
Received: Apr 27, 2021; **Revised:** May 22, 2021; **Accepted:** May 27, 2021; **Published online:** May 31, 2021

INTRODUCTION

The Lygaeidae are a family in the Hemiptera (true bugs), with more than 110 genera in 4 subfamilies. The family includes the insects commonly known as milkweed bugs, and also some of those known as seed bugs (Dellapé et al., 2019). Although there have been local studies in Western Turkey, there has not been any detailed study on this area up to now. The studies of Aysev (1974), Lodos et al. (1978) and Çakır & Önder (1990), Abacıgil et al., (2010); are the other important studies on fauna of Turkish Lygaeidae. During this time; Totally 149 species were found in 59 genera and in 12 families in Central Anatolia and Western Black Sea Regions locations (Lodos et al. 1999). In the last time study on Lygaeoidea; three species were recorded from Turkey*: Emblethis solitarius* Jakovlev, 1882*; Orsillodes longirostris* Puton, 1884 (both Rhyparochromidae) and *Horvathiolus*

kiritshenkoi kiritshenkoi Josifov, 1965 (Çerçi and Tezcan, 2020). Studies on this family need to be detailed in Western part of Turkey.

MATERIAL AND METHODS

The Lygaeidae species were collected in different habitats in İzmir, Aydın, Denizli and Manisa provinces, One light trap on the ground was used for each area from the mid June to the mid September. A 20 watt Philips energy saver white day light bulb was used at each trap and traps were cleared at two weeks intervals. The specimens were identified by Armand Matocq (Paris/France).

RESULTS

***Remaudiereana annulipes* (Barensprung, 1859)**

Material examined: Manisa, Alaşehir, 01.08.2013, 2 male, 1 female, Totally: 3 exc.

Distribution in Turkey: Adana, Balıkesir, İzmir, İstanbul (Abacıgil et al., 2010; Yazıcı et al., 2015; Anonymous, 2021).

Note: New record in Manisa province.

***Eremocoris abietis* (Linnaeus, 1758)**

Material examined: İzmir, Seferihisar, 15.08.2013, 4 male, 1 female, Totally: 5 exc.

Distribution in Turkey: Bitlis (Tatvan) (Pericart, 1998).

Note: Second record in Turkey fauna.

***Beosus quadripunctatus* (Müller, 1766)**

Material examined: Manisa, Alaşehir, 15.07.2013, 3 male, Totally: 3 exc.

Distribution in Turkey: Widespread (Önder et al., 2006: Matocq & Özgen, 2010; Özgen et al., 2018).

***Nysius cymoides* (Spinola, 1837)**

Material examined: Manisa, Alaşehir, 01.08.2013, 12 male, 13 female, **Totally**: 25 exc

Distribution in Turkey: Widespread (Özgen et al., 2020).

***Lamprodema maura* (Fabricius, 1803)**

Material examined: Manisa, Alaşehir, 01.07.2013, 15 male, 6 female, **Totally**: 21 exc

Distribution in Turkey: Balıkesir, Diyarbakır, Edirne (Abacıgil et al., 2010; Tezcan et al., 2010).

***Metopoplax origani* (Kolenati, 1845)**

Material examined: İzmir, Seferihisar, 15.08.2013, 5 male, **Totally**: 5 exc

Distribution in Turkey: Widespread (Çerçi et al., 2018).

***Camptocera glaberrima* (Walker, 1872)**

Material examined: İzmir, Seferihisar, 15.05.2013, 14 male, 7 female, **Totally**: 21 exc

Distribution in Turkey: Adana, Diyarbakır, Kahramanmaraş, Hatay, Gaziantep, Siirt (Önder & Adıgüzel, 1979; Çağatay, 1985; Önder et al., 2006; Matocq & Özgen, 2010).

ACKNOWLEDGEMENTS

The authors are thankful to expert for identification of the Lygaeidae species to Armand Matocq (Paris/France).

REFERENCES

Abacıgil, T. Ö., Varlı, S. V. ve S. Tezcan., 2010, Edremit (Balıkesir) Körfezi çevresindeki zeytin bahçelerinde kışlak tuzaklarla saptanan Heteroptera türleri. *Türkiye Entomoloji Dergisi,* 34 (1): 105-115.

Anonymous, 2021, http://dogalhayat.org/property/lygaeidae-remaudiereana-annulipes/. Date: 15.04.2021.

Aysev, N., 1974, *Ege Bölgesi Lygaeidae Familyası Üzerinde Sistematik Çalışmalar*. Güven Matbaası, Ankara, 149 pp.

Çağatay, N., 1985, Türkiye Rhyparochrominae (Heteroptera-Lygaeidae) alt familyasının taksonomisi ve erkek genital organının önemi üzerinde çalışmalar [Studies on the taxonomy and the morphology of male genitalia of Rhyparochrominae (Heteroptera-Lygaeidae) from Turkey. *Bitki Koruma Bülteni,* 5 (3-4): 73-92.

Çakır, S., Önder, F., 1990, Türkiye Geocorinae (Het.: Lygaeidae) altfamilyası üzerinde

sistematik ve faunistik çalışmalar. *Türk. Entomol. Derg.,* 14: 37-52.

Çerçi, B., Özgen, İ., Dioli, P., 2018, Additional Faunistic Notes on Heteroptera (Hemiptera: Insecta) in East Anatolia (Turkey), *Journal of Entomology and Zoology Studies,* 2018; 6(1): 1225-1231.

Çerçi, B., Tezcan, S., 2020, Contribution to the Lygaeoidea (Heteroptera) fauna of Turkey based on specimens preserved in the Lodos Entomological Museum, Turkey (LEMT) and additional information. *Journal of Insect Biodiversity,*15(1): 6-15.

Dellapé, Pablo M., Henry, Thomas J., 2019, "Family Lygaeidae Schilling, 1829". Lygaeoidea Species File. Retrieved 2019-06-19.

Yazıcı, G., Yıldırım, E., Moulet, P., 2015, Contribution to the knowledge of the Lygaeoidea (Hemiptera, Heteroptera) fauna of Turkey, *Linzer biol. Beitr.,* 47/1: 969-990.

Lodos, N., Önder, F., Pehlivan, E., Atalay, R., 1978, *Ege ve Marmara Bölgelerinin Zararlı Böcek Faunasının Tespiti Üzerinde Çalışmalar [(Curculionidae, Scarabaeidae (Coleoptera); Pentatomidae, Lygaeidae, Miridae (Heteroptera)].* T.C. Gıda, Tarım ve Hayvancılık Bakanlığı, Zir. Müc. Zir. Kar. Gen. Md. Yay., Ankara, 301 pp.

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 Üniversitesi Yayınları, İzmir, 58 s.

Matocq, A., Özgen, İ., 2010, A Preliminary List of Heteroptera Collected in Mardin and Siirt Provinces from South-Eastern Anatolia of Turkey (Hemiptera). *Mun. Ent. Zool.,* 5 (suppl.): 1011-1019.

Péricart, J., 1998, *Hémiptères Lygaeidae euro-méditerranéens, volume 2. Faune de France.* Vol. 84B. Fédération Française des Sociétés de Sciences Naturelles, Paris, 453 pp.

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 biol. Beitr.* 42/1: 817-823.

Önder, F., Adıgüzel, N., 1979, Some Heteroptera collected by light trap in Diyabakir (Turkey). *Türkiye Bitki Koruma Dergisi*, 3 (1): 25-34.

Önder, F., Karsavuran, Y., Tezcan, S., Fent, M., 2006, *Türkiye Heteroptera (Insecta) Kataloğu [Turkey Heteroptera (Insecta) catalogue].* Meta Basım Matbaacılık Hizmetleri, Bornova-Izmir, 164 p.

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.* Vol. LI , No. 4 (176) / 2018: 87-95.

Özgen, İ., Kara, B.K., Miroğlu, S., Dioli, P., 2020, A New Potential Pest of East and South-Eastern Anatolia in Turkey: *Nysius cymoides* (Spinola, 1837) (Heteroptera, Lygaeidae). *Mun. Ent. Zool.* Vol. 15, 1: (265-267)

AUTHOR GUIDELINES

Aims & Scope

The *Journal of the Heteroptera of Turkey* is a biannual peer reviewed international journal that publishes original articles, review articles, and short communication on all aspects of Heteroptera.

The *Journal of the Heteroptera of Turkey* publishes qualified research articles on the systematics, taxonomy, faunistical and ecology of heteroptera suborder. The topic of the research may include a wide range of heteropteran fields. Detailed studies on systematics, morphology, ecology, and phenology of heteroptera, and the biological, ecological, and faunistic formation of heteroptera taxons.

In this Journal full-papers and short communications containing original researches on any aspect of heteropteran in palaearctic region and Turkey will be considered as publication.

The *Journal of the Heteroptera of Turkey* welcomes review articles in the field of heteropteran.

The *Journal of the Heteroptera of Turkey* also published short notes on heteropteran topics. Information of the heteropteran specialists and book reviews will also be published.

We would like to make an open invitation to all potential contributors. We have a fast publishing process to process and evaluate.

Taxonomic revisions and descriptions of individual species will be accepted especially if additional information is included on habitat preferences, behavior, phenology etc. Descriptions of single specimens are discouraged.

For submitted article there are restrictions on the subject, author, geographic area, and so on of any submission (palaearctic only). For our journal mission all fields of heteroptera studies are suitable.

All papers being peer-reviewed by two referees, and under rapid publication process.

Preparation of Manuscript

All manuscripts should be written in the Turkish or English languages to be published only in the Journal of the Heteroptera and should be prepared with Microsoft Word.

Manuscripts should be written on A4 (21 cm x 29.7 cm) paper with margins of at least 2 cm in width.

All pages should be numbered consecutively. Manuscripts should be organized in the following order: Title, abstract, brief introduction, materials and methods, results, discussion, acknowledgments, references, tables and figure legends.

Parts of the Manuscript should be:

Arrange manuscripts in this order: title; name(s), address(es) and e-mail address(es) of the corresponding author(s) who will receive and approve the page proofs (research articles only); keywords; text; acknowledgments; references; tables and figure legends.

Title: The title of the manuscript should be informative and clear, not exceed 15-20 words. Just under the title full name(s) of author(s); (surname(s) in capital letters; full address(es); e-mail address(es); if available, ORCID numbers for all authors, Corresponding Author contact information should be give (each on a separate line).

Abstract: The abstract should not exceed 250-300 words (maximum), should be one paragraph.

Keywords: For subject indexing, up to 6 topical keywords in English are required (for Turkish articles).

Text: Introduction, Materials and Methods, Results, Conclusion and Discussion, Acknowledgments, References, Figure and table legends.

Use italics for Scientific names of genera, species, and subspecific taxa.
Do not use italics for abbreviations such as “spp.”, “sp.”, “ssp.”, ”var.”, ”gen.nov.”, “sp.n.”, “ssp.nov.”, “stat.n.”, “comb.n.”, “s.l.”, “s. str.”, “et al.”, and names of taxa of rank higher than genus.
For faunistic research follow this order: Taxon name, Material examined, Habitat, Host plant(s), Distribution. Example:
Miridae Hahn, 1831
Deraeocoris rutilus (Herrich-Schaeffer, 1838)
Habitat: The specimens belonging to *D. rutilus* (H.,-S., 1838) were found on *Carduus pycnocephalus* subsp. *albidus* (Bieb) Kazmi.
Materials examined: 1 male, 24.6.1996 (Loc. 1), 1 female, 24.6.1996 (Loc.6).

Distribution in Turkey: The Aegean, the Marmara, and the Anatolia regions (18,10,8,13,29).
Distribution in the world: Israel, Sardinia, Syria, Cyprus, Poland, the Balkans, Russia, and Turkey (18,25).

References: References should be prepared according to "*The Guidelines to Authors*".

The complete reference list should appear alphabetically by name at the end of the paper. A sample of the most common entries in reference lists appears below. Please note that a DOI should be provided for all references where available.

References must be cited in the text as (Dursun, 2013), Fent & Dursun (2005) or Fent et al. (1997), or in a parenthesis (Dursun, 2013; Fent & Dursun, 2005; or Fent et al. ,1997).

Journal article: Abbreviate names of periodicals basically according to the World List of Scientific Periodicals, 4th Edition, Butterworths, London, 1964–1965. (If you are not certain about the correct abbreviation, give the journal's name in full).

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.

Books: Alexi Popov, A., Grozeva, S., Simov,N., Tasheva, E., 2013, *Advances in Hemipterology*, PenSoft Publishers Ltd, 377 pp., Sofia, Bulgaria.

Article/Chapter in Book: Kerzhner, I. M., Jaczewski, T. L.,1964, *Order Hemiptera (Heteroptera) 851–1118pp. I*n: *Keys to the insects of the European USSR 1. (Ed. G. Y. Bei-Bienko).* Nauka, Moskva & Leningrad [in Russian; English translation, Israel Program for Scientific Translations, Jerusalem, 1967]. 1214 pp.

No Author Given: (USDA) U.S. Department of Agriculture. 2001. Title. USDA, Beltsville, MD. (IRRI) International Rice Research Institute. 2001. Title. IRRI, City, State or Country.

Proceedings: Šeat, J., Kaur, H., Gallé, R., Torma, A. 2018, The role of road verges as secoundary linear habitats for Forest steppe Heteroptera, *8th European Hemiptera Congress*, 24-29 Jun 2018, Zawiercie, Poland. Book of Abstracts, 61 p.

Theses/Dissertations: James, H., 2001, Thesis or dissertation title. M.S. thesis or Ph.D. dissertation, University of Pennsylvania, Philadelphia.

Özsaraç, Ö., 2004, Çiçekdağı (Kırşehir) Heteropterleri, Basılmamış Doktora Tezi, Gazi Üniversitesi Fen Bilimleri Enstitüsü, Ankara, 225 s.

Online Citations/ Websites: Rabitsch, W., 2005, Spezialpraktikum aquatische und semiaquatische Heteroptera; (Web page: http: homepage.univie.ac.at/wolfgang.rabitsch).(Date accessed: May 2010).

Using the DOI (Digital Object Identifier) Number: Nestel D., Papadopoulos N. T. & Miranda Chueca M. A. (2008). Current advances in the study of the ecology of fruit flies from Europe, Africa and the Middle East. *Journal of Applied Entomology*, DOI: 10.1111/j.1439-0418.2008.01378.x

Please note on the illustrations, figure, table, and photographs legends: Illustrations should be arranged into blocks or plates by the author(s). Figures should be provided electronically in either JPG or TIFF format. JPG images should be the highest resolution possible. TIFF images should be at 300 dpi resolution.

Morphological illustrations (if not schematic) and **photographs/** electron microscope micrographs should include scale bars. Photographs and electron microscope micrographs must be in JPEG file format (300 dpi).

Images pasted into Word become low-resolution and cannot be used in print.

Photographs should be high-contrast, black and white or color. Lettering should be typed and legible. All papers should be accompanied by information on the credited photographer or copyright holder. If the photographer or copyright holder is not an author on the paper, then permission must be granted by the copyright holder.

Tables should be numbered consecutively and include headings and explanations. References in the text to illustrations (schematic, photographs) and tables into parenthesis: e.g.(Fig.1) (Figs.1–4) (Table 1.) (Table 1., Figs.1-4). Morphological illustrations should be provided with scale bars.

Taxonomic papers in *JHT* must follow the *requirements below:* Follow all requirements of the current *International Code of Zoological Nomenclature* (4th edition 1999), and be followed the recommendations of the Code.

A holotype should always be designated for each newly described species-level taxon and at least holotypes should be deposited in public collections that provide long-term care and access for study (note that such deposition is mandatory for neotypes). For this reason, two particular recommendations (73A and 16C) should be observed in JHT.

In the Abstract must be listed new combinations, new status, new taxa, new synonyms, etc. in. The list of synonymized names must indicate their disposition. For newly should be described taxa included for all newly synonymized or combined names. Use “sp. n.”, “gen. n.” etc.. **Important note:** Descriptions based on single specimens are discouraged.

The standard order of sections for description a species is: “Diagnosis”, “Description”, “Material”, “Type locality”, “Etymology”, “Distribution”, “Biology”, and other comments if appropriate. Author(s) of species name must be provided when the scientific name of any animal species is first mentioned. (The year of publication is not compulsory. ıf you give it, then provide a full reference of this in the reference list.)

It is the *author’s responsibility* to know the group, both material and literature, well enough (preferably on a worldwide basis) to be able to ensure that all relevant taxa were taken into account and that any new taxa proposed have not already been described from elsewhere.

Accepted manuscripts are published online and in two issues at the end of May and December.