

## Contributions to the Bolkar Mountains Cixiidae Fauna With a New Record and an Identification Key for Turkey's *Tachycixius* (Hemiptera: Auchenorrhyncha)

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Abstract.- In this study 19 specimens belonging to the family Cixiidae were examined that were collected from Bolkar Mountains in 2005-2007; nine species were identified. Two species are added to the list of previously known species from the region, of which one of them is a new record for the Turkish fauna. Existing species distributions have been extended. The number of *Tachycixius* species known from Turkey was increased to 6 with *Tachycixius cypricus* Dlabola, 1974. An identification key is given for these six *Tachycixius* species.

Keywords: *Cixius*, *Hyalesthes*, *Pentastira*, *Reptalus*, endemism, zoogeography.

### INTRODUCTION

Cixiidae is a family with 221 genera and 2416 species worldwide (Flow, 2015). There are 22 genera and 212 species in the Palearctic region (Nast, 1972, 1982), 100 species in Europe (Holzinger *et al.*, 2003) and 13 genera and 46 species in Turkey (Önder *et al.*, 2011; Lodos and Kalkandelen, 1980). A key to the genera of European Cixiidae is given by Holzinger (2002). Family members' bodies can be described as dorso-ventrally flattened, head and pronotum are more or less keeled, and wings are generally transparent but sometimes patterned and hairy. However, external morphologic features are not stable and penis structure is more complicated. That is caused to complicate their identification (Emeljanov, 1995). Female Cixiidae secrete a waxy white fluid from end of their abdomens to protect their eggs. Their inner genitalia and surface of wax plate morphology are not known clearly (Holzinger *et al.*, 2002). As a hemimetabole family, the nymphs feed on plant roots and adolescents suck sap from various plant parts, although their biology is not well known. With adolescents sucking sap from plants, many diseases are spread between plants, especially

damaging to cultivated plants, reducing farming efficiency (Kalkandelen, 1988; Kramer, 1983). Therefore, they have economic importance.

The genus *Tachycixius* Wagner, 1939 presently comprises in Palearctic region 25 species (D'urso, 1999; Flow, 2015; Hoch and Asche 1993; Holzinger, 2000; Nast, 1972, 1982; Orosz, 1999; Remane and Hoch, 1988). All species were distributed to the Western palearctic and until this work, five of them are known from Turkey. The heads of *Tachycixius* species are narrow than pronotum and vertex are shorter than width at the median. Mesonotum has three longitudinal keels and side keels are diverging from each other to the posterior. Setaceous front wings have tubercles between the apical veins and transversely band patterned. When the distributional data were analysed, it was seen that the majority of these species were shown regional endemism.

In this article many new genera have been defined and new records have been presented. It is expected that in future studies, the number of records will increase since many areas in Turkey have not yet been explored.

### MATERIALS AND METHODS

This research is based on 19 Cixiidae (Hemiptera) samples (1 female, 18 male) founded in the Bolkar Mountains İçel (Mersin, Tarsus, Çamlıyayla, Erdemli, Silifke ve Mut), Adana

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0030-9923/2015/0005-1341 \$ 8.00/0  
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(Pozantı), Niğde (Ulukışla), Karaman (Central and Ayrancı), and Konya (Ereğli and Halkapınar) between the months April-August during 2005-2007.

Samples were collected by sweeping net, killed and stored in 70% ethyl alcohol. By using Magellan Explorist GPS coordinates of genera and species, data were collected and sorted with ArcView 3.3 map program, and distribution maps prepared. Identification of collected samples were made using Dlabola (1957, 1971, 1974a,b, 1981), Emeljanov (1964), Fieber (1876), Hoch (1986), Holzinger *et al.* (2003), Kalkandelen (1987, 1988, 1989, 1990, 1993, 1994, 2000), Kirschbaum (1868), Le Quesne (1960) and Ossiannilsson (1978).

The images of the samples were enhanced with Adobe Photoshop after taking photos with a stereo-microscope camera (Leica EZ4D) which was located in the herbarium of Gazi. These samples are stored in Gazi University Prof. Dr. Metin Aktaş Zoology Museum (GUZM).

## RESULTS

### *Cixius (Ceraticoxius) pallipes* Fieber, 1876

#### *Material examined*

Turkey, Mersin, Silifke, Kirobası, Sarıaydınlı Village, Stream Valley, 36° 45' N, 33° 55' E, 1357m, 29 June 2007, 1♂, leg. Demirel, E.

#### *Distribution*

##### *World*

Afghanistan, Armenia, Azerbaijan, Bulgaria, Cyprus, France (Corsica), Georgia, Greece, Hungary, Iraq, Israel, Italy (type locality), Moldova, Romania, Sardinia, Slovakia, Spain??, Switzerland, Tadjikistan, Turkey and former Yugoslavia (Nast, 1972; Önder *et al.*, 2011; Hoch, 2015).

##### *Turkey*

Adana, Adıyaman, Afyon, Ankara, Antalya, Artvin, Aydın, Balıkesir, Bartın, Çanakkale, Çankırı, Diyarbakır, Düzce Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Gümüşhane, Hakkâri, Iğdır, İzmir, Karaman, Kırşehir, Konya, Kütahya, Kahramanmaraş, Malatya, Mardin, Muğla, Ordu, Sakarya, Samsun, Tokat, Şanlıurfa and Yozgat (Önder *et al.*, 2011).

### *Cixius (Ceraticoxius) remotus* Edwards, 1888

#### *Material examined*

Turkey, Karaman, Ayrancı, Ayrancı Dam, 37° 19' N, 33° 44' E, 1213m, 1 July 2007, 1♂, leg. Demirel, E.

#### *Distribution*

##### *World*

Arabian Peninsula, Armenia, Azerbaijan, Belgium, Bulgaria, Caucasian Russian Republics, England, Egypt (Sinai Peninsula) France, Georgia, Greece, Iran, Iraq, Israel, Lebanon, Jordan, Syria, Turkey and former Yugoslavia (Nast, 1972; Önder *et al.*, 2011; Hoch, 2015).

##### *Turkey*

Adana, Antalya, Erzurum and Konya (Önder *et al.*, 2011).

### *Hyalesthes mlokosieviczi* Signoret, 1879

#### *Material examined*

Turkey, Niğde, Ulukışla, Emirler Village, 37° 29' N, 34° 31' E, 1603m, 10 July 2005, 1♂, leg. Demirel, E.; Turkey, Konya, Ereğli, Yazlık Village, 37° 27' N, 34° 6' E, 1136m, 10 July 2005, 3♂♂, leg. Demirel, E.

#### *Distribution*

##### *World*

Arabian Peninsula, Azerbaijan, Armenia, Caucasian Russian Republics, Cyprus, East Palaearctic, Georgia, Iran, Iraq, Israel, Jordan, Lebanon, Russia (South), Sinai Peninsula (Egypt), Syria, Turkey, Turkmenistan and Ukraine (Nast, 1972; Önder *et al.*, 2011; Hoch, 2015).

##### *Turkey*

Adana, Adıyaman, Afyon, Ankara, Antalya, Aydın, Bilecik, Burdur, Çankırı, Diyarbakır, Gaziantep, Isparta, İzmir, Kahramanmaraş, Kilis, Malatya, Mardin, Mersin, Muğla, Siirt, Şanlıurfa and Tokat (Önder *et al.*, 2011).

### *Hyalesthes obsoletus* Signoret, 1865

#### *Material examined*

Turkey, Adana, Pozantı, Akçatekir,

Karboğazı, 37° 20' N, 34° 41' E, 1607m, 27 July 2005, 6♂♂, leg. Demirel, E.

*Distribution*

*World*

Afghanistan, Albania, Algeria, Arabian Peninsula, Armenia, Austria, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, France (Corsica), Georgia, Germany, Greece (Crete, Cyclades Is., Dodecanese Is. and North Aegean Is.), Hungary, Iran, Iraq, Israel, Italy (Sardinia and Sicily), Jordan, Kazakhstan, Lebanon, Moldova, Kyrgyzstan, Macedonia, Malta, Portugal, Romania, Russia, Slovakia, Slovenia, Spain (Balearic Is.), Sweden, Switzerland, Syria, Tajikistan, Tunisia, Turkey, Ukraine, Uzbekistan, and the former Yugoslavia (Nast, 1972; Önder *et al.*, 2011; Hoch, 2015).

*Turkey*

Adana, Afyon, Adıyaman, Ağrı, Ankara, Antalya, Aydın, Balıkesir, Bolu, Burdur, Bursa, Çanakkale, Çankırı, Çorum, Diyarbakır, Düzce, Edirne, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Hakkâri, Iğdır, Isparta, İstanbul, Kahramanmaraş, Konya, Malatya, Mardin, Mersin, Muğla, Nevşehir, Ordu, Rize, Sakarya, Sinop, Sivas, Tokat, Trabzon, Şanlıurfa and Van (Önder *et al.*, 2011).

*Pentastira major* Kirschbaum, 1868

*Material examined*

Turkey, Niğde, Ulukışla, Darboğaz Village, 37° 28' N, 34° 32' E, 1543m, 21 July 2006, 1♂, leg. Demirel, E.

*Distribution*

*World*

Albania, Arabian Peninsula, Armenia, Azerbaidjan, Caucasian Russian Republics, Cyprus, Egypt (Sinai Peninsula) Georgia, Greece (Crete, Dodecanese Is. and North Aegean Is.), Hungary, Iran Iraq, Israel, Italy, Jordan, Lebanon, Romania, Syria, Turkey and Ukraine (Nast, 1972; Önder *et al.*, 2011; Hoch, 2015).

*Turkey*

Adana, Ankara, Antalya, Bolu, Çankırı,

Çorum, Diyarbakır, Gaziantep, Giresun, Hatay, Isparta, İzmir, Konya, Karaman, Kahramanmaraş, Manisa, Mardin, Muş, Niğde, Samsun, Tekirdağ, Tokat, Şanlıurfa, Van and Yozgat (Önder *et al.*, 2011).

*Pentastira megista* Emeljanov, 1978

*Material examined*

Turkey, Mersin, Mut, Mut–Ermenek Path, 36° 35' N, 33° 14' E, 610m, 12 June 2007, 1♂, leg. Demirel, E.

*Distribution*

*World*

Azerbaijan and Turkey (Nast, 1972; Önder *et al.*, 2011).

*Turkey*

Adana, Ankara, Antalya, Çankırı, Diyarbakır, Erzurum, Konya, Karaman, Muş, Niğde and Yozgat (Önder *et al.*, 2011).

*Pentastira rorida* (Fieber, 1876)

*Material examined*

Turkey, Mersin, Çamlıyayla, Sebil, Hunting protection area, Bağdat Monastery, Suçatı, 37° 12' N, 34° 28' E, 1504m, 30 July 2007, 2♂♂, leg. Demirel, E.

*Distribution*

*World*

Afghanistan, Azerbaijan, Bulgaria, Czech Republic (Moravia), Greece (Corfu and Cyclades Is.), Hungary, Romania, Russia, Slovakia, Syria, Turkey, Ukraine and the former Yugoslavia (Nast, 1972; Önder *et al.*, 2011; Hoch, 2015).

*Turkey*

Balıkesir, Edirne, Erzincan, İzmir, Manisa, Mardin and Tokat (Önder *et al.*, 2011).

*Reptalus oleae* Dlabola, 1987

*Material examined*

Turkey, Mersin, Silifke, İmamlı Village, 36° 27' N, 33° 57' E, 613m, 18 May 2006, 1♂, leg. Demirel, E.

*Distribution**World*

Turkey (Nast, 1972 and Önder *et al.*, 2011)

*Turkey*

Antalya, Mersin and Muğla (Önder *et al.*, 2011).

*Tachycixius cypricus* Dlabola, 1974

*Material examined*

Turkey, Mersin, Çamlıyayla, Sebil, Hunting protection area, Meşeli fountain, 37° 12' N, 34° 29' E, 1538m, 30 July 2007, 1♂, 1♀, leg. Demirel, E. (Fig. 1.)

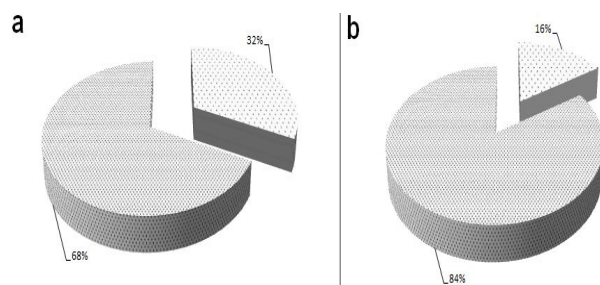


Fig. 1. Local endemism rate of *Tachycixius* genus. a) According to spreading in only one country b) According to spreading in at most 2 countries.

*Distribution**World*

Cyprus (Nast, 1972)

*Turkey*

New record for Turkey.

**DISCUSSION**

After examination of the specimens, nine species are defined. Among them, *Pentastira rorida* (Fieber, 1876) is a new record for the regional fauna. *Tachycixius cypricus* Dlabola, 1974 is new record for Turkish fauna. *Pentastiridius leporinus* (Linnaeus, 1761), *Pentastiridius pallens* (Germar, 1821), *Setapius barajus* (Dlabola, 1957) and *Setapius lindbergi* (Dlabola, 1957) have been mentioned in previous studies (Linnavuori, 1962;

1965; Lodos and Kalkandelen, 1980; Dlabola, 1981; Kalkandelen, 1990), but were not seen in this study. The number of species recorded for the region is increased to 13 with this study.

When spreading data of *Tachycixius* species are analysed, it can be seen that most types of these species show local endemism by spreading in only one country at a rate of 68% (17/25) (Fig. 1a). It can even be seen that this rate becomes 84% when it is considered that there are only four species (*Tachycixius desertorum* (Fieber, 1876), *Tachycixius pilosus* (Olivier, 1791), *Tachycixius tigrina* Logvinenko, 1971 ve *Tachycixius venustus* Germar, 1830) spreading in 3 or more countries (21/25) (Fig. 1b).

Until this study, *Tachycixius cypricus* Dlabola, 1974 was only known from Cyprus Island. It is zoogeographically interesting that *Tachycixius* species show high local endemism in spite of territorial connections, and they spread in Turkey despite of marine barrier. The genus *Tachycixius* is represented by five species from Turkey (Dlabola, 1971; Lodos and Kalkandelen, 1980; Kalkandelen, 1980; Demir, 2007). These are *Tachycixius bidentifer* Dlabola, 1971, *Tachycixius creticus* Dlabola, 1974, *Tachycixius desertorum* (Fieber, 1876), *Tachycixius logvinenkovae* Dlabola, 1974 and *Tachycixius pilosus* (Oliver, 1791). With this study *Tachycixius cypricus* Dlabola, 1974 is added and the number increased to six. An identification key for the species of *Tachycixius* recorded from Turkey is provided here.

**KEY TO TURKISH TACHYCIXIUS**

- 1 Ventral of aedeagal sheath with simple and long spined and seen clearly from the dorsal..... 2
- Ventral of aedeagal sheath with no spine..... 3
- 2 Aedeagal apical spines as long as lateral spines in dorsal view ..... *desertorum*
- Aedeagal apical spines longer than lateral spines which are shorter in dorsal view..... *pilosus*
- 3 All aedeagal apical spines tips simple ..... *logvinenkovae*
- At least one of the aedeagal apical spine tips is forked 4
- 4 One of the aedeagal apical spine tips is simple ..... *cypricus* (Fig. 2.)
- Aedeagal apical spines are forked at the tips..... 5
- 5 Apical lob of anal tube is smooth at the corners..... *bidentifer*
- Apical lob of anal tube is swollen at the corners ..... *creticus*

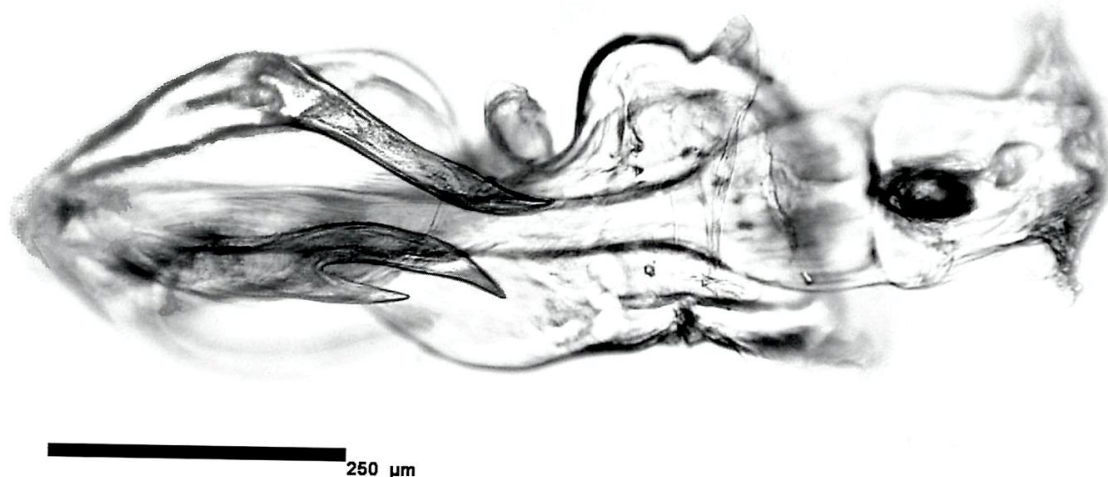


Fig. 2. Dorsal view of aedeagus of *Tachycixius cypricus* Dlabola, 1974.

#### ACKNOWLEDGEMENT

This study is part of the corresponding author's Ph.D. thesis which is supported by Gazi University's Projects of Scientific Investigation Department with the code 05/2006-11.

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(Received 9 March 2015, revised 29 April 2015)