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Original article (Orijinal araştırma)

A new species of *Trionymus* (Berg, 1899) (Hemiptera: Pseudococcidae) genus in Turkey[1]

Türkiye'de *Trionymus* (Berg, 1899) (Hemiptera: Pseudococcidae) cinsine ait yeni bir tür

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Abstract

The genus *Trionymus* (Berg, 1899) (Hemiptera: Coccomorpha: Pseudococcidae) was investigated based on samples collected on plants from Poaceae, Cyperaceae and Juncaceae in Aydın Province, Turkey, between 2019 and 2020. The specimens of the new species were collected on *Juncus acutus* L. (Poales: Juncaceae) and were slide-mounted. In total, 10 specimens were examined under a microscope and illustrations were prepared. As a result of the study, *Trionymus oncueri* sp. n. Kaydan & Yerlikaya is described and illustrated. In addition, an identification key for the currently known *Trionymus* species found on Poaceae, Cyperaceae and Juncaceae (Poales) in the Palearctic Region is provided and discussed.

Keywords: Identification key, new species, taxonomy, *Trionymus,* Turkey

Öz

Aydın İli'ndeki Poaceae, Cyperaceae ve Juncaceae familyasına bağlı bitkilerinden 2019-2020 yıllarında toplanan *Trionymus* (Berg**,** 1899) (Hemiptera: Coccomorpha: Pseudococcidae) cinsine ait örnekler incelenmiştir. Yeni türe ait örnekler *Juncus acutus* L. (Poales: Juncaceae) üzerinden toplanmış ve preparatları yapılmıştır. Toplam olarak 10 adet örnek laboratuvarda mikroskop altında incelenmiş ve yeni bir *Trionymus* türü olarak, *Trionymus oncueri* sp. n. Kaydan & Yerlikaya tanımlanmıştır. Çalışmada ayrıca, Palearktik Bölge'de Poaceae, Cyperaceae ve Juncaceae (Poales) üzerinde bulunan ve halihazırda bilinen *Trionymus* türleri için bir teşhis anahtarı oluşturulmuş ve tartışılmıştır.

Anahtar sözcükler: Teşhis anahtarı, yeni tür, taksonomi, *Trionymus,* Türkiye

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Introduction

Turkey is a country with 783,562 km^2 area connecting Asia, Africa and Europe, and has many different habitats with unique ecological peculiarities in different latitudes and altitudes. There are different biogeographical regions, namely, Europe-Siberia (Kars-Erzurum plate), Iranian-Turan (from eastern Turkey to Middle Anatolia), and south and the west coasts of the country are under Mediterranean climatic conditions. As a result of this diversity of ecology, many regions show different form of ecosystems and their transitions among the zones. Although most of the ecosystems in the country are steppes, many other lands include distinct ecosystems such as forests, mountains, wetlands, coastal and marine, and different combinations of these systems. So, tremendous number of fauna and flora species and their populations are enabling to occur in such diverse of ecological characteristics.

The presence of waxy and powdery secretions on their body is the main characteristic of mealybugs. In general, mealybugs in life are often dorsoventrally compressed, and vary from oval-elongated to rounded in shape, and pinkish to grayish in color, and covered by white powdery wax in life (Cox & Ben-Dove, 1986; Kaydan et al., 2015). Mealybugs being nourished on a variety of woody and herbaceous plants, and they are usually localized to a specific part of the host (Williams, 2004).

The mealybugs in the Coccomorpha represent the second largest family group with 2,256 species in 291 genera in three families, Pseudococcidae, Rhizoecidae and Putoidae (Garcia Morales et al., 2020). About 700 species in 106 genera are known in the Palearctic Region (Garcia Morales et al., 2020). *Pseudococcus* Westwood, 1840, *Dysmicoccus* Ferris, 1950, and *Phenacoccus* Cockerell, 1893 are the most species-rich among the 46 genera of the family Pseudococcidae in Palearctic region (Garcia Morales et al., 2020). There are 77 species of mealybugs recorded in Turkey, and the most abundant genera are *Phenacoccus*, *Peliococcus* Borchsenius, 1948, *Pelionella* Kaydan, 2015, and *Trionymus* (Berg, 1899) (Hemiptera: Pseudococcidae) (Kaydan et al., 2013, 2015).

Some species of *Trionymus* resemble some species of *Dysmicoccus* and the distinction appears to be arbitrary. Recently, *Trionymus multivorus* (Kiritchenko, 1936) was synonymized with *Trionymus angustifrons* Hall, 1926, and its transfer to *Dysmicoccus* as *Dysmicoccus angustifrons* (Hall, 1926) suggested (Matile-Ferrero et al., 2015). Three species of the genus, *Trionymus aberrans* Goux, 1938, *Trionymus cressae* (Hall, 1927), and *Trionymus perrisii* (Signoret, 1875) were listed for the scale insect fauna of Turkey (Kaydan et al., 2013), and all of them were collected from monocotyledonous plants.

In this study, a new *Trionymus* species collected from leaf sheets of *Juncus acutus* L. (Poales: Juncaceae) is described and illustrated based on adult female morphology. In addition, an identification key for the currently known *Trionymus* species found on Poaceae, Cyperaceae and Juncaceae (Poales) in the Palearctic Region is provided.

Materials and Methods

Collecting of the specimens

The mealybug specimens were collected on roots of the weed *J. acutus* in a wetland area during a survey conducted in 2019-2020 in Aydın Province, Turkey. In total, ten specimens were examined and evaluated in the laboratory.

Identification of the specimens

Slide-mounted adult female mealybug specimens were prepared at the Plant Protection Department of Çukurova University, Adana, Turkey, according to Kosztarab & Kozár (1988) with a slight modification (the specimens were rinsed with ionized water using a fine brush to rinsed off the KOH). Identification studies were performed using the keys constructed by Danzig & Gavrilov-Zimin (2015), and Kosztarab & Kozar (1988). The slides are stored in the Çukurova University Coccoidea collection, Adana, Turkey (KPTC).

Morphometric methods

Trionymus specimens were examined under a phase-contrast compound microscope (Leica DM2500), and the main taxonomic characters were measured for the species description. The morphological terms followed Williams (2004) and Williams & Granara de Willink (1992). Measurements were performed recording the maximum dimensions (e.g., body width was recorded at the widest part) and are expressed as a range. In the measurements, the claw is excluded in the tarsal length, yet the setal base is included in setal lengths. Cerarii are numbered after Williams & Granara de Willink (1992), with cerarius one being on the head, anterior to the antenna, and cerarius 17 being on segment VIII.

A generalized individual was represented in a drawing based on several specimens used for the description. The left half of dorsum and the right half of venter were represented in each illustration which is divided longitudinally. Structural details are shown as enlargements around the central drawing, and are drawn to different scales. Although translucent pores on the hind legs are located mostly on the dorsal surface, they are illustrated ventrally on the main drawing for convenience.

Results

Genus: *Trionymus* (Berg, 1899) (Hemiptera: Pseudococcidae)

Type species: *Trionymus perrisii* (Signoret, 1875) (Hemiptera: Pseudococcidae)

Synonym: *Westwoodia* Signoret, 1875; *Signoretia* Kraatz, 1988; *Bergrothia* Kraatz, 1988; *Bergrothiella* Reitter, 1898; *Pergandiella* Cockerell, 1899.

Diagnosis: Adapted from Williams (2004).

Adult female

Body of adult female elongate normally broadly oval, with 5 or fewer pairs of cerarii; 1-4 pairs usually situated on last abdominal segments, occasionally 1 or 2 pairs present on head margin. Anal lobe cerarii each containing paired setae, either conical or setose, with or without trilocular pores next to collars, all situated on a membranous or sclerotized area. Antennae each 6-8 segmented. Legs well developed; claw without a denticle. Sometimes anterior proximal edge of hind coxa indistinct, with translucent pores extending onto surrounding derm. Circuli present or absent. Spiracles normal, not surrounded by sclerotized areas. Both ostioles pairs present. Ventral surface of each anal lobe usually membranous. Anal ring usually situated at apex of abdomen, bearing 6 hair-like setae. Oral collar tubular ducts of different sizes present or absent on dorsum, always present on venter; sometimes abundant. Multilocular disc pores present at least on venter.

The genus has a worldwide distribution with 124 species of which 61 species have a Palearctic distribution. Most species feed on grass leaves; usually under leaf sheaths, stems or roots. Four species have been recorded in Turkey, namely *T. aberrans*, *T. cressa* and *T. perrisii* (Kaydan et al., 2013). Recently Williams et al. (2015) considered *T. multivorus* as *D. angustifrons*. However, Kaydan et al. (2015) recorded *Trionymus artemisiarum* (Borchsenius, 1949) but did not mention that it was a new species record for Turkey. However, Kaydan et al. (2015) indicated that *T. artemisiarum* was not a typical member of the genus *Trionymus* and placed in the Trabutini clade in their phylogenetic tree. For this reason, *T. artemisiarum* was not included in the following key to species of *Trionymus*.

Key to adult females of *Trionymus* (Berg, 1899) of the Palearctic region modified from Danzig and Gavrilov-Zimin (2015), and Kosztarab & Kozar (1988)

1. Trilocular pores numerous and more or less evenly distributed on body sides 2

- Trilocular pores only on venter few and unevenly scattered ..... *T. borchsenii* (Danzig, 1983)

2. Anal ring horseshoe-shaped ..... *T. aberrans* Goux, 1938

- Anal ring more or less rounded 3

3. Anal ring complicated with 2 or more outer rows of spinule 4

- Anal ring complete or with reduced number of pores and spinule 5

4. Anal ring with 2 rows of spinule; multilocular pores present on abdominal sternites only ..... *T. pietranerae* Goux, 1941

- Anal ring with 3-4 rows of spinule; multilocular pores scattered on all body surfaces ..... *T. polyporus* Hall, 1924

5. Tubular ducts with pores attached to duct opening ..... *T. williamsi* Ezzat, 1959

-Tubular ducts without attached pores 6

6. Multilocular pores scattered on all dorsum and on all or on p-most part of venter 7

- Multilocular pores present mainly in transverse rows on abdominal segments and more rarely occasionally present on venter surface of cephalothorax 10

7. Cerarii numbering 1 pair 8

- Cerarii numbering 2-3 pairs ..... *T. internodii* (Hall, 1923)

8. Anal ring simplified; circuli absent ..... *T. masrensis* Hall, 1925

- Anal ring complete; circulus present 9

9. All oral collar tubular ducts of about one size ..... *T. diminutus* (Leonardi, 1918)

- Oral collar tubular ducts of two sizes ..... *T. phragmitis* (Hall, 1923)

10. Anal lobe cerarii do not lie on sclerotized plate or slight sclerotization present only just near the bases of cerarian setae 11

- Anal lobe cerarii lies on large sclerotization plate 18

11. Oral collar tubular ducts of simple type only ..... *T. copiosus* (Borchsenius, 1949)

- Tubular ducts with collars of different shape and size 12

12. Anal ring reduced number of pores and spinule ..... *T. caucasicus* (Danzig, 1985)

- Anal ring complete 13

13. Oral collar tubular ducts of 3 sizes ..... *T. santilongi* (Mazzeo, 1995)

- Oral collar tubular ducts of 1 or 2 sizes 14

14. Oral collar tubular ducts of about 1 size ..... *T. danzigae* (Kozár & Kosztarab, 1976)

- Oral collar tubular ducts of 2 sizes 15

15. Oral collar tubular ducts with deep collar, occupying almost half of duct length 16

- Oral collar tubular ducts with small collar poorly visible; occupying almost less than one third of duct length 17

16. Dorsal oral collar tubular ducts of one size ..... *T. radicum* (Danzig, 1986)

- Dorsal oral collar tubular ducts of two sizes ..... *T. dagestanicus* Danzig, 1998

17. Dorsal oral collar tubular ducts of two sizes, dorsal multilocular pores present .....

..... *T. hamberdi* (Borchsenius, 1949)

- Dorsal oral collar tubular ducts of one size, dorsal multilocular pores absent..*T. thulensis* Green, 1931

18. Tubular ducts with very wide and deep collar occupying about half of duct length .....

.....*T. kirgisicus* (Borchsenius, 1949)

- Tubular duct with small narrow collar or simple 19

19. Sclerotized plate of anal lobe similar in size or only slightly larger than anal ring with 25-45 trilocular pores 20

- Sclerotized plate of anal lobe significantly larger than anal ring with 70-75 trilocular pores.....

.....*T. phalaridis* (Green, 1925)

20. Multilocular disc pores present on cephalothorax on dorsum and venter ..... *T. perrisii* (Signoret, 1875)

- Multilocular disc pores absent on cephalothorax on dorsum and venter .....

.....*T. oncueri* **sp. n.** Kaydan & Yerlikaya

***Trionymus oncueri* sp. n. Kaydan & Yerlikaya (Figure 1)**

Material examined. Holotype: Aydın: Çine, Doğanyurt, 37°35'51"N, 27°59'32"E, 61 m, 15.V.2019, *Juncus acutus*, H. Yerlikaya, M. Bora Kaydan, 1 adult female (marked with red circle); Paratypes: Aydın: Nazilli, 37°53'38"N, 28°19'38"E, 66 m, 05.VIII.2019, *Juncus acutus*, H. Yerlikaya, 4 adult females; as same label as holotype are on the same slide.

Description of the slide-mounted adult female

Adult female. Body elongate-oval, 2.74-4.72 mm long, 0.56-1.04 mm wide. Eyes marginal, about 35.0-37.5 µm wide. Antenna 8 segmented, 380-420 µm long; apical segment 87.5-95 µm long, 30.0-32.5 µm wide, with 4 fleshy setae, each setae 40.0-42.5 µm long and apical setae each 40-45 µm long. Clypeolabral shield 190-195 µm long, 170-175 µm wide. Labium 3 segmented, 110-115 µm long, 110-115 µm wide. Anterior spiracles each 50-55 µm long, 22.5-25.0 µm wide across atrium; posterior spiracles each 60-65 µm long, 30-35 µm wide across atrium. Legs well developed, length data for posterior legs: coxa 150-155 µm with 8-10 translucent pores present, trochanter plus femur 260-270 µm, tibia plus tarsus 310-315, claw 25-30 µm. Ratio of lengths of tibia plus tarsus to trochanter plus femur 1.06-1.09:1; ratio of lengths of tibia to tarsus 0.89-1.0:1; ratio of length of hind trochanter plus femur to greatest width of femur 2.75-3.2:1. Tarsal digitules capitate, each 47.5-50.0 µm long. Claw digitules capitate, 27.5-30.0 µm long. Both pairs of ostioles present; anterior ostioles each with a total for both lips of 6–9 trilocular pores and no setae; posterior ostioles each with a total for both lips of 17-22 trilocular pores and 1–3 esetae. Anal ring 85-90 µm wide, bearing 6 setae with each setae 110-130 µm long.

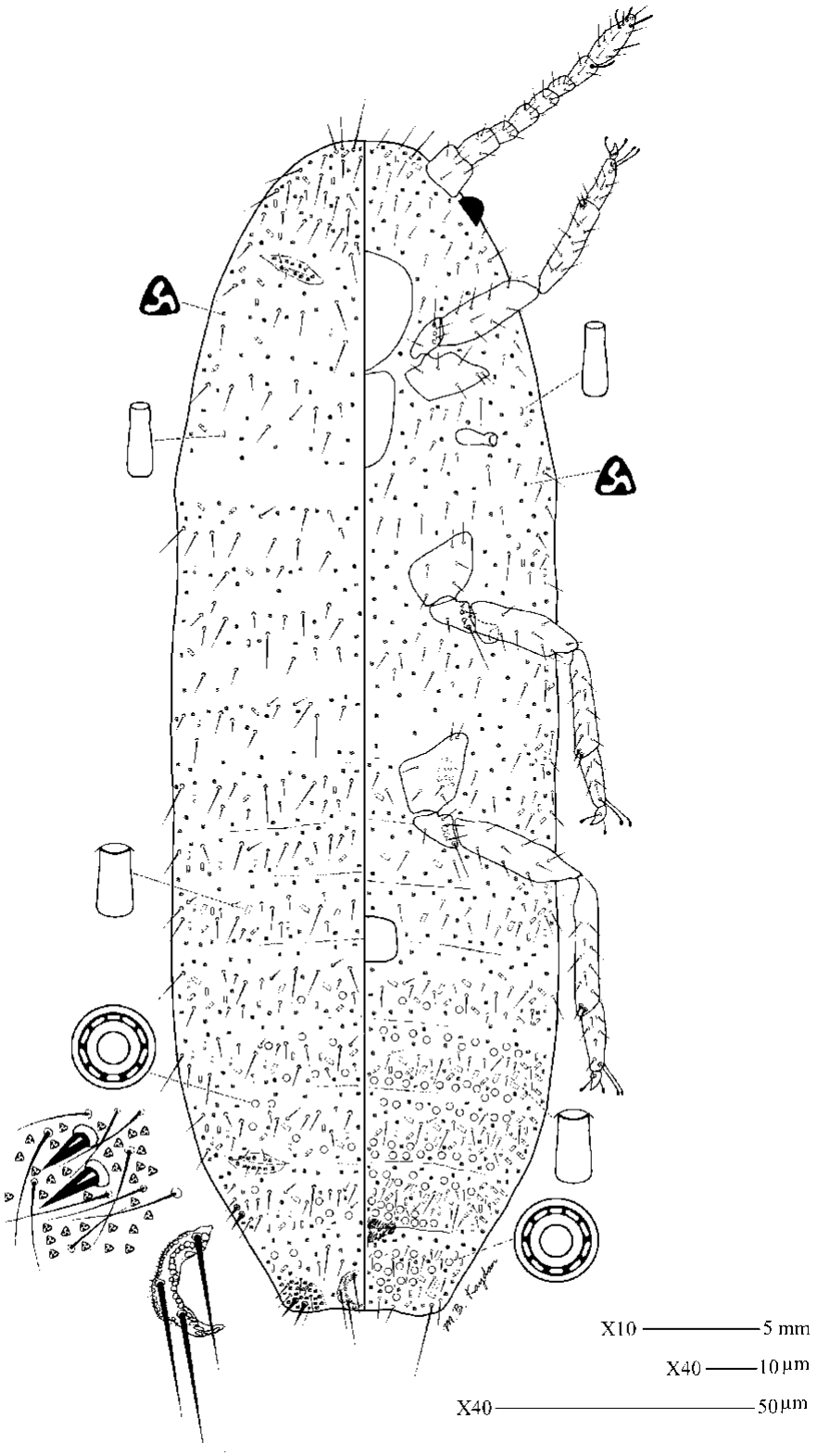

Figure 1. *Trionymus oncueri* Kaydan & Yerlikaya, sp.n. (General illustration x10 is used; for the details surrounding the main illustration x40 is used).

Dorsum. Derm membranous, anal lobe cerarii present, each with 2 conical cerarian setae, each 20-25 µm long, 30-35 trilocular pores and 7 or 8 axillary setae on sclerotized area. Body setae flagellate, each 15-50 µm long, scattered on head, thorax and abdominal segments. Trilocular pores each 2.5-3.0 µm in diameter, scattered over entire body. Multilocular disc pores each 7.5-8.0 µm in diameter present on abdominal segments; as follows: segment IV, 5-7; V, 15-17; VI, 19-21; VII, 8-10; VIII plus IX, 5-7. Oral collar tubular ducts of two sizes; larger one, each 7.0-8.0 µm long and 3.0-3.5 µm wide, present over entire body and as single rows across on abdominal segments, smaller one, each 5 µm long and 2.0-2.5 µm wide present on submarginal area on abdominal segments, thorax and head.

Venter. Setae flagellate, each 15-90 µm long, longest setae situated medially on head. Apical setae of anal 145-155 µm long. Multilocular disc pores each 7.5-8.0 µm in diameter present on abdominal segments as follows: segment IV, 7-9; V, 22-24; VI, 60-64; VII, 70-76; VIII plus IX, 40-42. Trilocular pores, each 3-4 µm in diameter, scattered. Oral collar tubular ducts in two sizes; larger one, each 7-10 µm long, 5 µm wide, present over most of body and as single rows across the abdominal segments, as follows: segment I-III, 27-31; IV, 49-51; V, 72-76; VI, 74-78; VII, 45-49; VIII plus IX, 30-34; smaller one each 5 µm long and 2.0-2.5 µm wide, in single rows across the abdominal segments and submarginal area on thorax and head.

Comments

Trionymus oncueri Kaydan & Yerlikaya **sp. n.** is characterized by the following combination of features: (1) one pair of cerarii, (2) multilocular disc pores present on dorsum on abdominal segments, (3) oral collar tubular ducts in two sizes present in transverse rows on abdominal segments, scattered on thorax and head (4) translucent pores present on coxa and (5) eight segmented antennae. *Trionymus oncueri* Kaydan & Yerlikaya is closest to *Trionymus perrisii* (Signoret) in having (1) anal lobe cerarii lies on large sclerotization plate, one pair of cerari, (2) multilocular disc pores present on dorsum on abdominal segments, (3) oral collar tubular ducts in two sizes present in tranverse rows on abdominal segments, scattered on thorax and head, but differs from *T. perrisii* lacking multilocular disc pores on head and thorax on dorsum.

Etymology

This species is named after very famous Entomologist, Prof. Dr. Cezmi Öncüer, who made great and valuable entomological studies in Ege University and Adnan Menderes University, Agricultural Faculty, Plant Protection Department (İzmir and Aydın, respectively) in Turkey.

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