



Gall Forming Wasp Species of Oak Forests in Bolu

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Abstract

Oak cynipid galls were collected between 2006-2019 to reveal species diversity of oak gall wasps (Hymenoptera, Cynipidae, Cynipini) in Bolu. Collected galls were brought to laboratory and kept at room temperature in jars covered by tulle until adult cynipid wasps emerged. As a result, 44 species from 8 genera showed that *Andricus* is the most specious genus with 26 species. Our results indicate that Bolu bears high gall wasp species diversity. In this study, new distribution ranges are provided for most of the cynipid species previously reported for Turkey.

Keywords: Cynipidae; Hymenoptera; Oak gall wasp; Diversity; Bolu.

Bolu Meşe Ormanlarında Gal Oluşturan Arı Türleri

Öz

Meşe gal arısı (Hymenoptera, Cynipidae, Cynipini) çeşitliliğini belirleyebilmek için 2006-2019 yılları arasında Bolu'da arazi çalışmaları yapılmıştır. Toplanan mazılar laboratuvara getirilerek kavanozlara konulmuş ve tülle kapatılarak oda sıcaklığında ergin gal arısı elde edilene dek tutulmuşlardır. Çalışma sonucunda belirlenen 8 cinse ait toplam 44 cynipid türü belirlenmiş, 26 tür ile *Andricus* cinsinin en fazla tür sayısına sahip grup olduğu belirlenmiştir. Sonuçlar



Bolu’da gal arısı çeşitliliğinin yüksek olduğunu ortaya koymuştur. Bu çalışma ile Türkiye’nin meşe gal arısı türleri için yeni lokasyonlar belirlenmiştir.

Anahtar Kelimeler: Cynipidae; Hymenoptera; Meşe mazı arısı; Çeşitlilik; Bolu.

1. Introduction

Different arthropod groups from insects to acaroid species and other organisms from bacteria, fungi to viruses induce galls on a variety of plant taxa [1]. Among insects, the majority of gall-inducing species are gall wasps (Hymenoptera, Cynipidae, Cynipini) that are represented by more than 1400 species classified under 40 genera with worldwide distribution [2]. In the northern hemisphere, the Nearctic region with nearly 700 cynipid species is richer than the Palearctic region, which hosts roughly around 300 species [3, 4]. Gall forming cynipids prefer different parts of predominantly oak species from the family Fagaceae as their hosts [5]. They form their galls in roots, leaves, shoots, branches, stems, flowers, and other parts of oak trees [6].

At the junction of three phytogeographic regions, 24 taxa including species, subspecies and varieties are known to exist in nearly 5.938.527 hectares area in the Turkish forests [7, 8]. Until recent years, there have not been many studies in oak gall wasps despite the richness in the host plant species in Turkey. However, there is currently an increase in these obligate guests of oaks [9-18]. A recent checklist study reported 148 species under 25 genera of cynipids representing 9 tribes [19]. The tribe Cynipini hosts 110 species under 12 genera and galls variety of oak taxa from *Quercus*, *Cerris* and *Ilex* sections. Majority of the species are from the genus *Andricus* with 77 species followed by *Cynips*, *Neuroterus* and other genera. A recent study added two new records for the Turkish cynipid fauna [20]. Despite the acceleration in oak gall wasp research the Turkish oak cynipid gall wasp fauna still remains little-known, and it is estimated that the number of gall wasp species is much higher than the current reports.

With this study, we aim to contribute to the knowledge of the Turkish oak cynipid fauna with special emphasis given to Bolu since it is rich in oaks. Bolu is located in the northwestern part of Turkey which is an important city being in the passageway between Anatolia and the Thrace considering its floral elements. Among a variety of oak species and their natural hybrids *Quercus petraea* (Mattuschka) Liebl., *Q. robur* L. ve *Q. pubescens* Willd. are the dominant oak species in the forestry areas of Bolu. This paper gives species diversity as well as new distribution localities of some Turkish oak gall wasp species since so far, no study was carried out to determine oak gall wasp fauna of the studied area.

2. Materials and Methods

The materials examined in this study were collected between May and November from 2006 to 2019 from Bolu Province located in the western part of the Black Sea area of Turkey. Oak cynipid galls were collected from *Quercus petraea*, *Q. pubescens*, *Q. robur* and *Q. infectoria*. Coordinates of the sampling sites were recorded using a Garmin model Geographic Positioning System (GPS). After collecting galls, they were put in a plastic bag and brought into the laboratory. All gall samples were kept in jars covered by tulle under laboratory conditions until cynipid wasps emerged from the galls. Both gall and adult gall wasp morphologies were used for the identification of specimens by the authors following the key provided in Melika 2006 [6]. The materials are kept in Abant İzzet Baysal University, Department of Biology, Molecular Zoology Laboratory, Bolu.

3. Results and Discussion

In this study, a total of 44 species under 8 genera (listed below) from the tribe Cynipini were recorded from Bolu.

Andricus aries (Giraud, 1859)

Material examined: Gerede Dağkara Village, N 40° 47' E 32° 22', 09-07-2008, 1 gall, Gölköy, N 40° 71' E 31° 51', 26-09-2011, 1 gall, Seben Ekiciler Village, N 40° 25' E 31° 31', 09-07-2008, 2 galls, Güneyce Village, N 40° 21' E 31° 28', 09-07-2008, 3 galls, Kazanuçuran, N 40° 28' E 31° 32', 09-07-2008, 1 gall. Host: *Quercus pubescens*, *Q. petraea*.

Andricus bulgaricus Vassileva-Samnalieva, 1977

Material examined: Gölköy, N 40° 71' E 31° 51', 14-10-2011, 1 gall, Mengen Gökçesu near Çaydeğirmeni Road, N 41° 16' E 32° 04', 18-07-2006, 22 galls, Host: *Quercus petraea*.

Andricus caputmedusae (Hartig, 1843)

Material examined: Gölköy, N 40° 71' E 31° 51', 17-09-2011, 3 galls, Göynük Çamlıca Village, N 40° 13' E 30° 56', 19-08-2010, 5 galls, Kumcuk Village, N 40° 22' E 30° 43', 19-08-2010, 6 galls, Kürnuç Village, N 40° 13' E 30° 41', 19-08-2007, 4 galls, Kıbrısık Belen Village, N 40° 22' E 31° 70', 15-07-2009, 7 galls, Kalkara Village, N 40° 24' E 31° 46', 15-07-2009, 3 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Andricus coriarius* (Hartig, 1843)**

Material examined: Gölköy, N 40° 71' E 31° 51', 12-09-2011, 4 galls, Göynük Karacalar Village, N 40° 22' E 30° 37', 19-08-2010, 2 galls, Ahmetbeyler Village, N 40° 12' E 30° 50', 19-08-2010, 3 galls, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-10-2011, 2 galls, Karakaya village, N 40° 54' E 31° 57', 05-08-2009, 2 galls. Host: *Quercus petraea*.

***Andricus coronatus* (Giraud, 1859)**

Material examined: Dörtdivan Çetikören Village, N 40° 41' E 31° 59', 27-07-2006, 7 galls, Yağbaşılar Village, N 40° 40' E 31° 58', 27-07-2009, 5 galls, Kındıra Village, N 40° 48' E 31° 58', 27-07-2006, 6 galls, Gölköy, N 40° 71' E 31° 51', 14-10-2011, 17 galls, Göynük Arıkçayırı Village, N 40° 28' E 30° 54', 19-08-2009, 9 galls, Mengen Babahızır Village, N 40° 54' E 32° 03', 14-07-2007, 8 galls, Çubuk Village, N 40° 59' E 32° 04', 14-07-2007, 4 galls. Host: *Quercus petraea*.

***Andricus corruptrix* (Schechtendal, 1870)**

Material examined: Gölköy, N 40° 71' E 31° 51', 01-10-2010, 7 galls, Hamidiye area, N 40° 67' E 31° 58', 29-10-2010, 9 galls, Kütükçüler, N 40° 45' E 31° 37', 21-08-2011, 5 galls, Tokmaklar, N 40° 48' E 31° 46', 21-08-2011, 8 galls. Host: *Quercus petraea*, *Q. pubescens*.

***Andricus curvator* Hartig, 1840**

Material examined: Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-07-2009, 1 gall, Macarlar Village, N 40° 49' E 32° 31', 22-07-2009, 5 galls, Ertuğrulköy Village, N 40° 49' E 32° 21', 11-06-2011, 3 galls, Salur-Karapazar, 40° 47' E 32° 22', 11-06-2011, 5 galls, Gölköy, N 40° 71' E 31° 51', 11-06-2011, 2 galls, Kıbrısık near Alan Village, N 40° 22' E 31° 45', 13 galls, Geriş N 40° 22' E 31° 47', 11-06-2011, 3 galls, Yeniçağa Saray-Yamanlar, N 40° 47' E 32° 22', 11-06-2011, 1 gall. Host: *Quercus petraea*, *Q. pubescens*.

***Andricus foecundatrix* (Hartig, 1840)**

Material examined: Dörtdivan Çetikören, N 40° 39' E 31° 59', 27-07-2006, 2 galls, Kındıra Village, N 40° 48' E 31° 50', 27-07-2007, 1 gall, Yağbaşılar Vilage, N 40° 39' E 31° 59', 27-07-2009, 2 galls, Gölköy, N 40° 71' E 31° 51', 12-09-2011, 6 galls, Kıbrısık Kalkara Village, N 40° 24' E 31° 46', 15-07-2009, 3 galls, near Belen Village, N 40° 25' E 31° 45', 17-07-2009, 3 galls. Host: *Quercus petraea*, *Q. robur*.

***Andricus gallaearnaeformis* (Fonscolombe, 1832)**

Material examined: Near Gök köy, N 40° 71' E 31° 51', 10-10-2019, 11 galls, Mudurnu Ekinören Village, N 40° 33' E 31° 01', 12-08-2006, 5 galls, Göllüören Village, N 40° 28' E 31° 35', 12-08-2006, 3 galls, Samsaçavuş Village, N 40° 29' E 31° 02', 12-08-2006, 4 galls. Host: *Quercus petraea*.

***Andricus gallaetinctoriae* (Olivier, 1791)**

Material examined: Gök köy, N 40° 71' E 31° 51', 01-09-2011, 8 galls, Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-08-2010, 4 galls, Macarlar Village, N 40° 49' E 32° 31', 22-08-2010, 6 galls, Mengen Karakaya Village, N 40° 54' E 31° 57', 05-08-2009, 4 galls, Mudurnu, N 40° 34' E 31° 04', 10-08-2010, 5 galls, Samsaçavuş Village, N 40° 29' E 31° 02', 12-08-2009, 7 galls. Host: *Quercus petraea*.

***Andricus glutinosus* Giraud, 1859**

Material examined: Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 4 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2009, 6 galls, Yağbaşlar Vilage, N 40° 39' E 31° 59', 17-09-2009, 5 galls, Gök köy, N 40° 71' E 31° 51', 01-10-2011, 9 galls, Mengen, N 40° 59' E 32° 03', 14-10-2011, near Dorukhan, N 41° 00' E 32° 03', 05-08-2009, 1 gall, Başyellice Village, N 41° 07' E 32° 58', 05-08-2009, 5 galls. Host: *Quercus petraea*.

***Andricus grossulariae* Giraud, 1859**

Material examined: Mengen Babahızır, N 40° 54' E 32° 03', 14-05-2011, 1 gall, Gökçesu, N 41° 26' E 32° 24', 18-07-2006, 1 gall. Host: *Quercus petraea*, *Q. robur*.

***Andricus infectorius* (Hartig, 1843)**

Material examined: Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 6 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 8 galls, Yağbaşlar Vilage, N 40° 39' E 31° 59', 17-09-2009, 9 galls, Seben Kozyaka Village, N 40° 25' E 31° 31', 09-07-2008, 5 galls, Çeltikdere Village, N 40° 25' E 31° 31', 09-07-2008, 5 galls, Gerede Dağkara Village, N 40° 19' E 31° 39', 09-07-2008, 2 galls, Gök köy, N 40° 71' E 31° 51', 19-09-2011, 5 galls, Mengen Avşar Village, N 40° 44' E 31° 52', 27-07-2009, 1 gall. Host: *Quercus petraea*.

***Andricus inflator* Hartig, 1840**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 6 galls, Gerede Macarlar Village, N 40° 49' E 32° 31', 22-09-2010, 7 galls, Salur-Karapazar, N 40° 47' E 32° 22', 11-09-2011, 3 galls, Gölköy, N 40° 71' E 31° 51', 02-09-2011, 7 galls, Göynük Karacalar Village, N 40° 22' E 30° 37', 10-09-2008, 6 galls, Kıbrısçık Belen Village, N 40° 22' E 31° 70', 15-09-2009, 6 galls, Mengen Babahızır, N 40° 54' E 32° 03', 14-05-2011, 6 galls, Mengen Gökçesu, N 41° 26' E 32° 24', 18-07-2006, 3 galls., Seben Alpagut Village, N 40° 45' E 31° 34', 21-09-2011, 1 gall. Host: *Quercus infectoria*.

***Andricus kollari* (Hartig, 1843)**

Material examined: Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 7 galls, Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-07-2009, 4 galls, Gölköy, N 40° 71' E 31° 51', 11-10-2011, 10 galls, Göynük Arıkçayırı, N 40° 28' E 30° 54', 19-08-2008, 9 galls, Akçaalan, N 40° 28' E 30° 55', 05-08-2010, 4 galls Mengen, N 40° 59' E 32° 03', 14-10-2011, 5 galls, Mudurnu Ekinören Village, N 40° 33' E 31° 01', 12-08-2009, 7 galls, Gelinözü, N 40° 27' E 31° 05', 12-08-2009, 3 galls, Göllüören Village, N 40° 28' E 31° 35', 12-08-2009, 2 galls, Taşkesti, N 40° 34' E 31° 04', 12-08-2009, 5 galls, Taşlık Village, N 40° 11' E 31° 11', 12-08-2009, 9 galls, Seben Kozyaka, N 40° 25' E 31° 31', 09-07-2008, 8 galls. Host: *Quercus petraea*.

***Andricus lignicolus* (Hartig, 1843)**

Material examined: Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-08-2009, 2 galls, Macarlar Village, N 40° 49' E 32° 31', 22-08-2009, 3 galls, Gölköy, N 40° 71' E 31° 51', 01-11-2011, 1 gall, Göynük Arıkçayırı, N 40° 28' E 30° 54', 19-08-2008, 6 galls, Akçaalan, N 40° 28' E 30° 55', 05-08-2010, 2 galls, Mengen Dereköy-Bürnük, N 40° 57' E 32° 08', 05-08-2010, 12 galls, Karacalar Village, N 40° 57' E 32° 14', 05-08-2010, 3 galls, Mudurnu Ekinören Village, N 40° 33' E 31° 01', 12-08-2009, 4 galls. Host: *Quercus petraea*, *Q. infectoria*, *Q. robur*.

***Andricus lucidus* (Hartig, 1843)**

Material examined: Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 8 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 9 galls, Yağbaşlar Village, N 40° 39' E 31° 59', 17-09-2009, 6 galls, Gölköy, N 40° 71' E 31° 51', 10-11-2011, 1 gall, Göynük, Arıkçayırı, N 40° 28' E 30° 54', 10-09-2008, 2 galls, Karacalar Village, N 40° 22' E 30° 37', 10-09-2008, 3 galls, Kumcuk Village N 40° 22' E 30° 43', 10-08-2008, 4 galls, Mengen Avşar Village, N 40° 44' E 31° 52', 27-07-2009, 6 galls, Karakaya village, N 40° 54' E 31° 57', 25-08-2009, 2 galls. Host: *Quercus petraea*.

***Andricus malpighii* (Adler, 1881)**

Material examined: Gököy, N 40° 71' E 31° 51', 11-10-2011, 15 galls, Abant, N 40° 71' E 31° 51', 04-06-2011, 12 galls, Aladağ, N 40° 40' E 31° 38', 09-07-2008, 17 galls. Host: *Quercus petraea*.

***Andricus mitratus* (Mayr, 1870)**

Material examined: Aladağ, N 40° 40' E 31° 38', 09-09-2008, 9 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 8 galls, Yağbaşlar Village, N 40° 39' E 31° 59', 27-07-2009, 3 galls, Kındıra Village N 40° 48' E 31° 50', 27-09-2007, 7 galls, Gököy, N 40° 71' E 31° 51', 26-08-2011, 8 galls, Kıbrıscık Kalkara Village, N 40° 24' E 31° 46', 18-09-2009, 5 galls, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-08-2007, 9 galls, Karakaya village, N 40° 54' E 31° 57', 05-08-2009, 8 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-08-2009, 13 galls, Güneyce Village, N 40° 21' E 31° 28', 09-08-2008, 6 galls. Host: *Quercus petraea*, *Q. infectoria*, *Q. pubescens*.

***Andricus quercusramuli* (Linnaeus, 1761)**

Material examined: Abant, N 40° 71' E 31° 51', 04-06-2011, 8 galls, Aladağ, N 40° 40' E 31° 38', 09-07-2008, 7 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-06-2007, 12 galls, Kındıra Village, N 40° 48' E 31° 50', 17-06-2007, 6 galls, Gerece Aktaşkurtlar, N 40° 50' E 32° 31', 22-06-2009, 5 galls, Gököy, N 40° 71' E 31° 51', 14-7-2011, 21 galls, Göynük Arıkçayırı, N 40° 28' E 30° 54', 10-06-2008, 7 galls, Kürnuç Village, N 40° 13' E 30° 41', 17-09-2011, 9 galls, Kıbrıscık Belen Village, N 40° 22' E 31° 70', 18-06-2009, 11 galls, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-6-2011, 4 galls, Mudurnu Ekinören Village, N 40° 33' E 31° 01', 12-06-2009, 5 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Andricus quercustozae* (Bosc, 1792)**

Material examined: Aladağ, N 40° 40' E 31° 38', 09-07-2008, 12 galls, Dörtdivan, Çetikören, N 40° 39' E 31° 59', 17-09-2007, 7 galls, Yağbaşlar Village, N 40° 39' E 31° 59', 27-07-2009, 9 galls, Kındıra Village, N 40° 48' E 31° 50', 27-07-2007, 6 galls, Gököy, N 40° 71' E 31° 51', 26-08-2011, 8 galls, Kıbrıscık Belen Village, N 40° 22' E 31° 70', 18-09-2009, 4 galls, Kalkara Village, N 40° 24' E 31° 46', 18-09-2009, 7 galls, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-07-2007, 2 galls, Karakaya village, N 40° 54' E 31° 57', 05-08-2009, 4 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-07-2009, 3 galls, Güneyce Village, N 40° 21' E 31° 28', 09-07-2008, 9 galls, Kozyaka, N 40° 25' E 31° 31', 09-07-2008, 8 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Andricus solitarius* (Fonscolombe, 1832)**

Material examined: Mengen Gökçesu, N 41° 21' E 32° 10', 18-07-2006, 5 galls. Host: *Quercus petraea*.

***Andricus stefanii* (Kieffer, 1897)**

Material examined: Mengen Çubuk Village, N 40° 59' E 32° 04', 14-10-2011, 2 galls, Gölköy, N 40° 71' E 31° 51', 09-10-2011, 5 galls, Seben Kozyaka N 40° 25' E 31° 31', 09-07-2008, 1 gall, Yeniçağ Saray-Yamanlar, N 40° 47' E 32° 22', 11-06-2011, 2 galls. Host: *Quercus petraea*.

***Andricus sternlichti* Bellido, Pujade-Villar, Melika, 2003**

Material examined: Gölköy, N 40° 71' E 31° 51', 09-10-2011, 10 galls, Hamidiye area, N 40° 67' E 31° 58', 29-10-2010, 13 galls, Kıbrısık Belen Village, N 40° 22' E 31° 70', 18-09-2009, 7 galls, Kalkara Village, N 40° 24' E 31° 46', 18-09-2009, 2 galls, Mudurnu Nallıhan Road, N 40° 28' E 31° 11', 12-06-2009, 8 galls. Host: *Quercus petraea*, *Q. pubescens*.

***Andricus theophrastea* (Trotter, 1866)**

Material examined: Gölköy, N 40° 71' E 31° 51', 09-10-2011, 5 galls, Hamidiye area, N 40° 67' E 31° 58', 29-10-2010, 9 galls, Kütükçüler, N 40° 45' E 31° 37', 21-08-2011, 1 gall, Tokmaklar, N 40° 48' E 31° 46', 21-08-2011, 3 galls, Göynük Akçaalan, N 40° 28' E 30° 55', 05-08-2010, 2 galls, Arıkçayırı, N 40° 28' E 30° 54', 19-08-2008, 4 galls, Bulanık Village, N 40° 24' E 30° 46', 19-08-2010, 1 gall, Karacalar Village, N 40° 22' E 30° 37', 10-09-2008, 2 galls, Kumcuk Village, N 40° 22' E 30° 43', 19-08-2010, 3 galls. Host: *Quercus petraea*.

***Andricus tomentosus* (Trotter, 1901)**

Material examined: Hamidiye area, N 40° 67' E 31° 58', 21-09-2009, 15 galls. Host: *Quercus petraea*.

***Biorhiza pallida* (Olivier, 1791)**

Material examined: Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-06-2010, 5 galls, Macarlar Village, N 40° 49' E 32° 31', 22-06-2010, 8 galls, Salur-Karapazar, 40° 47' E 32° 22', 11-06-2011, 7 galls, Gölköy, N 40° 71' E 31° 51', 02-06-2011, 14 galls, Göynük Akçaalan, N 40° 28' E 30° 55', 05-06-2010, 9 galls, Arıkçayırı, N 40° 28' E 30° 54', 19-06-2008, 8 galls, Karacalar Village, N 40° 22' E 30° 37', 10-06-2008, 6 galls, Kıbrısık Belen Village, N 40° 22'

E 31° 70', 15-06-2009, 9 galls, Mengen Babahızır, N 40° 54' E 32° 03', 14-06-2011, 7 galls, Gökçesu, N 41° 16' E 32° 04', 06-06-2011, 3 galls, Mudurnu, N 40° 28' E 31° 11', 12-06-2009, 2 galls, Seben Alpagut Village, N 40° 45' E 31° 34', 21-06-2011, 2 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Cerroneuroterus lanuginosus* (Giraud, 1859)**

Material examined: Aladağ, N 40° 40' E 31° 38', 09-07-2008, 13 galls, Abant, N 40° 71' E 31° 51', 04-09-2011, 21 galls, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-07-2007, 8 galls. Host: *Quercus petraea*.

***Cerroneuroterus minutulus* (Giraud, 1859)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 15 galls, Gölköy, N 40° 71' E 31° 51', 26-08-2011, 7 galls, Kıbrısık Belen Village, N 40° 22' E 31° 70', 18-09-2009, 3 galls, Kılıkara Village, N 40° 24' E 31° 46', 18-09-2009, 4 galls, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-07-2007, 6 galls, Karakaya village, N 40° 54' E 31° 57', 05-08-2009, 5 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-07-2009, 2 galls, Güneyce Village, N 40° 21' E 31° 28', 09-07-2008, 2 galls, Kozyaka, N 40° 25' E 31° 31', 09-07-2008, 7 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Chilaspis nitida* (Giraud, 1859)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 10 galls, Gölköy, N 40° 71' E 31° 51', 26-08-2011, 8 galls. Host: *Quercus petraea*.

***Cynips agama* Hartig, 1840**

Material examined: Aladağ, N 40° 40' E 31° 38', 09-07-2008, 5 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 8 galls, Kındıra Village, N 40° 48' E 31° 50', 27-07-2007, 3 galls, Gölköy, N 40° 71' E 31° 51', 26-08-2011, 6 galls, Kıbrısık Kılıkara Village, N 40° 24' E 31° 46', 18-09-2009, 4 galls, Mengen, Çubuk Village, N 40° 59' E 32° 04', 14-07-2007, 7 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-07-2009, 5 galls, Güneyce Village, N 40° 21' E 31° 28', 09-07-2008, 2 galls, Kozyaka N 40° 25' E 31° 31', 09-07-2008, 4 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Cynips disticha* Hartig, 1840**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 13 galls, Gerece Aktaşkurtlar, N 40° 50' E 32° 31', 22-09-2009, 8 galls, Ertuğrulköy Village, N 40° 49' E 32° 21', 11-09-2011,

7 galls, Gölköy, N 40° 71' E 31° 51', 26-05-2011, 16 galls, Mengen, N 40° 59' E 32° 03', 14-10-2011, Mudurnu Güllüören Village, N 40° 28' E 31° 35', 14-10-2011 3 galls, Taşkesti, N 40° 34' E 31° 04', 12-08-2009, 11 galls, near Taşlık Village, N 40° 11' E 31° 11', 14-10-2011, 5 galls. Host: *Quercus petraea*, *Q. pubescens*.

***Cynips divisa* Hartig, 1840**

Material examined: Dörtdivan Yağbaşlar Village, N 40° 40' E 31° 58', 27-07-2009, 14 galls, Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-07-2009, 21 galls, Macarlar Village, N 40° 49' E 32° 31', 22-07-2009, 3 galls, Gölköy, N 40° 71' E 31° 51', 14-10-2011, 1 gall, Kıbrısık Kalkara Village, N 40° 24' E 31° 46', 15-07-2009, 3 galls, near Belen Village, N 40° 25' E 31° 45', 17-07-2009, 3 galls, Hamidiye Village, N 40° 73' E 31° 54', 14-10-2011, 7 galls. Host: *Quercus petraea*.

***Cynips longiventris* Hartig, 1840**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 1 gall, Gerede, N 40° 40' E 32° 19', 05-09-2007, 2 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 7 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 9 galls, Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-09-2009, 7 galls, Macarlar Village, N 40° 49' E 32° 31', 22-09-2009, 6 galls, Gölköy, N 40° 71' E 31° 51', 02-06-2011, 20 galls, Kıbrısık Kalkara Village, N 40° 24' E 31° 46', 18-09-2009, 8 galls, near Mudurnu-Göynük Road, N 40° 42' E 31° 25', 04-09-2007, 2 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-08-2008, 3 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Cynips quercus* (Fourcroy, 1785)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 17 galls, Göynük Akçaalan Village, N 40° 28' E 30° 55', 19-08-2007, 11 galls, Arıkçayırı Village, N 40° 28' E 30° 54', 19-08-2007, 10 galls, Göynük Kürnuç Village, N 40° 13' E 30° 41', 19-08-2007, 7 galls, Kumcuk Village, N 40° 22' E 30° 43', 19-08-2007, 5 galls, Gölköy, N 40° 71' E 31° 51', 15-10-2011, 15 galls. Host: *Quercus petraea*.

***Cynips quercusfolii* (Linnaeus, 1758)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 8 galls, Aladağ, N 40° 40' E 31° 38', 09-07-2008, 7 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 12 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 6 galls, Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-07-2009, 5 galls, Gölköy, N 40° 71' E 31° 51', 14-10-2011, 21 galls, Göynük Arıkçayırı, N 40° 28' E 30° 54', 10-09-2008, 7 galls, Bulanık Village, N 40° 24' E 30° 46', 15-09-2010, 2

galls, Kumcuk Village, N 40° 22' E 30° 43', 17-09-2011, 4 galls, Kürnuç Village, N 40° 13' E 30° 41', 17-09-2011, 9 galls, Kıbrıscık Belen Village, N 40° 22' E 31° 70', 18-09-2009, 11 galls, Kalkara Village, N 40° 24' E 31° 46', 18-09-2009, 7 galls, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-10-2011, 4 galls, Karakaya village, N 40° 54' E 31° 57', 25-08-2009, 1 gall, Mudurnu Ekinören Village, N 40° 33' E 31° 01', 12-08-2009, 5 galls, Taşkesti, N 40° 34' E 31° 04', 12-08-2009, 7 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-07-2009, 6 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Neuroterus albipes* (Schenck, 1863)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 21 galls. Host: *Quercus petraea*.

***Neuroterus anthracinus* (Curtis, 1838)**

Material examined: Aladağ, N 40° 40' E 31° 38', 09-07-2008, 8 galls, Abant, N 40° 71' E 31° 51', 04-09-2011, 12 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 4 galls, Yağbaşılar Vilage, N 40° 39' E 31° 59', 27-07-2009, 6 galls, Kındıra Village, N 40° 48' E 31° 50', 27-07-2007, 3 galls, Gölköy, N 40° 71' E 31° 51', 14-10-2011, 1 gall, Mengen Çubuk Village, N 40° 59' E 32° 04', 14-07-2007, 4 galls, Karakaya village, N 40° 54' E 31° 57', 05-08-2009, 6 galls. Host: *Quercus petraea*.

***Neuroterus numismalis* (Fourcroy, 1785)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 15 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 2 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 7 galls, Göynük, Arıkçayırı, N 40° 28' E 30° 54', 10-09-2008, 11 galls, Bulanık Village, N 40° 24' E 30° 46', 15-09-2010, 8 galls, Mengen, N 40° 59' E 32° 03', 14-10-2011, 12 galls, Gökçesu, N 41° 16' E 32° 04', 06-06-2011, 6 galls, Seben near Alpagut Village, N 40° 45' E 31° 34', 21-08-2011, 3 galls. Host: *Quercus petraea*, *Q. pubescens*.

***Neuroterus politus* Hartig, 1840**

Material examined: Abant, N 40° 71' E 31° 51', 04-05-2011, 6 galls, Gerede Macarlar Village, N 40° 49' E 32° 31', 22-04-2010, 7 galls, Salur-Karapazar, 40° 47' E 32° 22', 11-05-2011, 3 galls, Gölköy, N 40° 71' E 31° 51', 02-05-2011, 7 galls, Göynük Arıkçayırı, N 40° 28' E 30° 54', 19-04-2008, 3 galls, Karacalar Village, N 40° 22' E 30° 37', 10-05-2008, 6 galls, Kıbrıscık Belen Village, N 40° 22' E 31° 70', 15-04-2009, 6 galls, Mengen Babahızır, N 40° 54'

E 32° 03', 14-05-2011, 6 galls, Mudurnu Nallıhan Road, N 40° 28' E 31° 11', 12-05-2009, 3 galls, Seben Alpagut Village, N 40° 45' E 31° 34', 21-04-2011, 1 gall. Host: *Quercus petraea*.

***Neuroterus quercusbaccarum* (Linnaeus, 1758)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 9 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 13 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 16 galls, Gölköy, N 40° 71' E 31° 51', 03-06-2011, 2 galls, Kıbrısçık Belen Village, N 40° 22' E 31° 70', 18-09-2009, 5 galls, Kılıkara Village, N 40° 24' E 31° 46', 18-09-2009, 8 galls, Mengen Avşar Village, N 40° 86' E 31° 84', 06-06-2011, 10 galls, Gökçesu, N 41° 16' E 32° 04', 06-06-2011, 4 galls, Mudurnu Ekinören Village, N 40° 33' E 31° 01', 12-08-2009, 15 galls, Taşkesti, N 40° 34' E 31° 04', 12-08-2009, 17 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-07-2009, 16 galls. Host: *Quercus petraea*, *Q. pubescens*.

***Neuroterus tricolor* (Hartig, 1841)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 22 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 11 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 8 gall, Yağbaşılar Vilage, N 40° 39' E 31° 59', 17-09-2009, 7 galls, Gölköy, N 40° 71' E 31° 51', 10-11-2011, 2 galls, Göynük, Arıkçayırı, N 40° 28' E 30° 54', 10-09-2008, 3 galls, Karacalar Village, N 40° 22' E 30° 37', 10-09-2008, 3 galls, Mengen Avşar Village, N 40° 44' E 31° 52', 27-07-2009, 10 galls. Host: *Quercus petraea*, *Q. infectoria*.

***Pseudoneuroterus saliens* (Kollar, 1857)**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 3 galls, Gölköy, N 40° 71' E 31° 51', 10-11-2011, 2 galls, Dörtdivan Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 1 gall, Göynük Karacalar Village, N 40° 22' E 30° 37', 10-09-2008, 2 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-07-2009, 2 galls. Host: *Quercus cerris*, *Q. petraea*, *Q. infectoria*.

***Trigonaspis synaspis* Hartig, 1841**

Material examined: Abant, N 40° 71' E 31° 51', 04-09-2011, 9 galls, Gerede, N 40° 40' E 32° 19', 05-09-2007, 4 galls, Dörtdivan Çetikören, N 40° 39' E 31° 59', 17-09-2007, 5 galls, Kındıra Village, N 40° 48' E 31° 50', 17-09-2007, 3 galls, Gerede Aktaşkurtlar, N 40° 50' E 32° 31', 22-09-2009, 6 galls, Macarlar Village, N 40° 49' E 32° 31', 22-09-2009, 6 galls, Gölköy, N 40° 71' E 31° 51', 14-105-2011, 7 galls, Kıbrısçık Kılıkara Village, N 40° 24' E 31° 46', 18-09-2009, 3 galls, Seben Çeltikdere, N 40° 22' E 31° 45', 15-08-2008, 2 galls. Host: *Quercus petraea*, *Q. pubescens*.

With this study, we found 44 cynipid species belonging to 8 different genera from the tribe Cynipini in Bolu. We determined that *Andricus* genus is the most specious group in Bolu which is represented by 26 species. The other genera members in the studied area include *Biorhiza* with one species, *Cerroneuroterus* with 2 species, *Chilaspis* with one species, *Cynips* and *Neuroterus* with 6 species each, *Pesudoneuroterus* and *Trigonaspis* genera are with one species.

5. Conclusions

This is the first detailed work on oak cynipids found in Bolu where all the given cynipid species in this study are recorded for the first time from the studied area. Latest studies on this parasitic insect group of oaks are becoming more popular and requires more attention. Reviewing the literature, it seems the cynipid fauna of Turkey has not yet been completed and requires further detailed investigation.

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