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New Record of Inquiline Wasp of The Genus *Synergus* Hartig, 1840 From Sivas, Turkey

Abstract

In the present study, it is aimed to determine inquiline wasp of oak galls from Sivas province and eight species were found belonging to genus *Synergus* (Hymenoptera: Cynipidae). These species are; *Synergus albipes* Hartig, 1841, *Synergus clandestinus* Eady 1952, *Synergus crassicornis* (Curtis, 1838), *Synergus pallicornis* Hartig, 1841, *Synergus pallidipennis* Mayr, 1872, *Synergus reinhardi* Mayr, 1872, *Synergus ruficornis* Hartig, 1840 and *Synergus umbraculus* (Olivier, 1791). *S.clandestinus* from these species are reported for the first time in the Turkish fauna. In addition to new record, *Andricus collari* were determined as a new host gall for *Synergus clandestinus*.

INTRODUCTION

The family Cynipidae is the largest of Cynipoidea superfamily and approximately 300 species are known from Western Palearctic (Csóka et al., 2005; Abe et al., 2007; Dalla-Torre and Kieffer, 1910; Melika, 2006; Nieves-Aldrey, 2001). Cynipidae are gall formers, or inquiline of gall-formers. Synergini inhabit the gall of the other Cynipidae and is called inquiline. *Synergus* is the most species-rich oak gall inquiline cynipid genus. The *Synergus* in the Palearctic presently comprises 40 species, (Pujade-Villar et al., 2003; Sadeghi et al., 2006). 16 *Synergus* species have been recorded from Turkey so far. (Bodenheimer, 1941; Katılmış and Kıyak, 2008; Kemal and Koçak, 2010; Askew et al., 2013; Azmaz, 2021). Although there are many studies on gall wasps in Turkey, there are not enough studies with inquiline wasps. For this reason, it is aimed to study inquiline wasps. Therefore, in this study, it was aimed to determine the species of inquiline gall wasps belonging to *Synergus*.

MATERIAL and METHODS

All the galls from Sivas province were collected in the months of May-July and September-November in 2019-2020. All the galls were collected from *Quercus macranthera* subsp. *sypirensis* which is an endemic oak subspecies native to Turkey. Collected galls, were brought to the laboratory in bags and galls were placed in a glass vials and then closed with a cotton ball covered with muslin. They were daily checked for the emergence of gall wasps. After the completion of emergence of gall wasps the specimens fixed on cards and pinned then were identified by using the relevant literature (Ionescu, 1957; Pujade-Villar and Nieves-Aldrey, 1993; Nieves-Aldrey, 2001; Pujade-Villar et al., 2003; Melika, 2006; Askew et al., 2013). All specimens were deposited in the Zoology Museum of Sivas Cumhuriyet University, Turkey.

RESULT and DISCUSSION

In this study, 8 species from genus *Synergus* belonging to the family Cynipidae were recorded from Sivas in Turkey. One of them, *Synergus clandestinus* Eady 1952, were recorded for the first time from Turkey. Although only *Andricus legitimus* were determined as a host gall for *Synergus clandestinus*, in our study, we found that *Andricus collari* is determined as a new host gall for *Synergus clandestinus*. These species, their host oaks, emergence time of adults, and associated oak galls are given presented alphabetically with their distributions as follow.

***Synergus albipes* Hartig, 1841**
Synergus pallipes Hartig, 1840
Synergus nervosus Hartig, 1841
Synergus flavicornis Hartig, 1840
Synergus nigripes Hartig, 1840
Synergus variolosus Hartig, 1841
Synergus varius Hartig, 1841
Synergus xanthocerus Hartig, 1841
Synergus tristis Mayr, 1873
Synergus hartigi Giraud, 1911
Synergus fulvipes Dettmer, 1924
Synergus mutabilis Dettmer, 1924

Distribution

Germany, Andorra, Austria, Great Britain, Algeria, Denmark, France, Netherlands, Ireland, Spain, Israel, Italy, Hungary, Poland, Portugal, Romania, Russia, Turkey, Ukraine, Greece (Askew et al., 2013; Katılmış and Azmaz, 2015; Melika, 2006; Pujade-Villar et al., 2003; Forshage et al., 2017).

Distribution in Turkey

Afyon, Artvin, Bayburt, Denizli, Gümüşhane, İstanbul, Kütahya, Ordu, Rize, Trabzon (Azmaz and Katılmış, 2017; Fahringer, 1922; Katılmış and Azmaz, 2015; Katılmış and Kıyak, 2008; Azmaz, 2021).

Examined material

1♀, 1.06.2020, Sarısuvat; 1♀, 5.11.2019, Hıdırnalı; 1♀, 1.10.2019, Konaközü; 1♂, 1.04.2020, Görünüm; 1♂, 4.05.2020, Konaközü; 1♂, 26.05.2020, Hıdırnalı; 1♂, 2.05.2020, Koştedere.

Host galls

A. coriarius, *A. grossulariae*, *A. kollari*, *Cynips divisa*, *C. quercusfolii*, *T. megaptera*

***Synergus clandestinus* eady, 1952 distribution**

Germany, America, Britain, Finland, Netherlands, Ireland, Hungary, Poland. (Pujade-Villar et al., 2003; Forshage et al., 2017).

Distribution in Turkey

It was recorded from Turkey for the first time with our study of this species.

Examined material

1♀, 9.10.2019, Çulhalı; 1♀, 2.11.2019, Düzceli; 1♀, 1.06.2020, Düzceli; 1♀, 1.06.2020, Yellece; 1♀, 9.06.2020, Hıdırnalı; 1♀, 6.06.2020, Yellece; 1♀, 1.06.2020, Yellece; 1♀, 1.06.2020, Yellece; 1♀, 26.05.2020, Bağlararası.

Host galls

Andricus legitimus, *Andricus kollari*. *Andricus kollari* is determined as a new host gall for *Synergus clandestinus*.

***Synergus crassicornis* (Curtis, 1838)**

Synergus evanescens Mayr, 1872. *Cynips crassicornis* Curtis, 1838. *Synergus fidelis* Tavares, 1920. *Synergus carinulatus* Dettmer, 1924 (sinonim Forshage ve ark., 2017).

Distribution

Germany, Andorra, Austria, Great Britain, France, Netherlands, Ireland, Spain, Sweden, Poland, Hungary, Portugal, Turkey, Ukraine (Askew et al., 2013; Katılmış and Azmaz, 2015; Melika 2006; Pujade-Villar et al., 2003; Forshage et al., 2017).

Distribution in Turkey

Denizli, Kütahya, Malatya (Hellrigl and Bodur, 2015; Katılmış and Azmaz, 2015).

Examined material

1♀, 8.10.2019, Bağlararası; 1♀, 9.10.2019, Düzceli; 1♀, 1.11.2019, Olukman; 1♀, 5.11.2019, Koştedere; 1♂, 1.06.2020, Koştedere; 1♂, 1.06.2020, Olukman; 1♂, 6.10.2019, Çöte; 21♀, 1.10.2019, Çorak; 1♀, 1.06.2020,

Düzceli; 1♀, 26.05.2020, Üngör; 1♀, 1.06.2020, Yellece; 1♀, 26.05.2020, Bağlararası; 1♀, 26.05.2020, Bağlararası; 1♀, 4.08.2020, Düzceli; 1♀, 23.05.2020, Olukman; 1♀, 23.05.2020, Kiremetli; 1♀, 23.05.2020, Görünüm; 1♀, 2.05.2020, Kiremetli; 1♂, 3.04.2020, Koştedere; 1♀, 6.11.2019, Olukman; 1♂, 9.09.2020, Üngör; 1♀, 25.09.2020, Düzceli.

Host galls

Andricus captusmedusae, *A. coriarius*, *A. fecundatrix*, *A. grossulariae*, *A. kollari*, *A. quercuscalicis*.

***Synergus pallicornis* Hartig, 1841**

S. pallicornis Dalla Torre, 1893

Distribution

Germany, Austria, Great Britain, Denmark, France, Croatia, Netherlands, Ireland, Spain, Sweden, Switzerland, Italy, Hungary, Poland, Portugal, Romania, Turkey, Ukraine, Greece (Askew et al., 2013; Katılmış and Azmaz, 2015; Katılmış and Kıyak, 2008; Melika 2006; Pujade-Villar et al., 2003; Forshage et al., 2017).

Distribution in Turkey

Afyon, Bayburt, Denizli, Giresun, Gümüşhane, İstanbul, Kütahya, Ordu (Azmaz and Katılmış, 2017; Fahringer, 1922; Katılmış and Azmaz, 2015; Katılmış and Kıyak, 2008; Azmaz, 2021).

Examined material

1♀, 5.10.2019, Görünüm; 1♀, 5.10.2019, Görünüm; 1♂, 5.10.2019, Görünüm; 1♀, 5.10.2019, Görünüm; 1♀, 17.10.2019, Sarısuvat; 1♀, 23.01.2020, Görünüm; 1♀, 23.01.2020, Sarısuvat; 1♀, 23.01.2020, Hıdırnalı; 1♂, 3.03.2019, Olukman; 1♂, 3.03.2019, Kıvşak; 1♂, 3.03.2019, Düzceli; 1♂, 3.03.2019, Üngör; 1♀, 3.03.2019, Yellece; 1♀, 3.03.2019, Yavu; 1♀, 3.03.2019, Kiremetli; 1♀, 31.10.2019, Bağlararası; 1♀, 31.10.2019, Bağlararası; 1♀, 31.10.2019, Bağlararası; 1♀, 2.11.2019, Çulhalı; 1♂, 2.11.2019, Çöte; 1♂, 5.11.2019, Hıdırnalı; 1♀, 5.02.2020, Çulhalı; 1♀, 5.02.2020, Emirhan; 1

♀,7.02.2019, Bağlararası; 1♀,15.02.2020, Kıvşak.

Host galls

Andricus captusmedusae, *A. coriarius*, *A. grossulariae*, *A. kollari*, *A. quercuscalicis*, *A. quercustozae*, *Cynips disticha*, *C.divisia*, *C.quercusfolii*.

***Synergus pallidipennis* Mayr, 1872**

Distribution

Austria, Great Britain, Croatia, Netherlands, Spain, Hungary, Portugal, Slovakia, Turkey, Ukraine, Greece (Askew et al., 2013; Katılmış and Azmaz, 2015; Melika, 2006; Pujade-Villar et al., 2003; Forshage et al., 2017).

Distribution in Turkey

Afyon, Artvin, İstanbul, Kütahya, Malatya, Rize (Azmaz and Katılmış 2017b; Hellrigl and Bodur, 2015; Katılmış and Azmaz, 2015; Azmaz, 2021)

Examined material

1 ♂, 2.11.2019, Düzceli; 1 ♂,15.10.2019, Üngör; 1 ♂, 15.10.2019, Düzceli; 1♀,5.11.2019, Görünüm; 1♂,1.06.2020, Hıdırnalı; 1 ♀, 26.05.2020, Emirhan; 1♀, 9.09.2020, Emirhan; 1 ♂, 9.09.2020, Hıdırnalı; 1♀, 25.09.2020, Düzceli.

Host galls

Andricus captusmedusae, *A.coriarius*, *A.kollari*, *A.lucidus* .

***Synergus rienhardi* mayr, 1872**

distribution

Germany, America, Austria, Britain, Algeria, France, Netherlands, Ireland, Spain, Italy, Hungary, Poland, Portugal, Roma, Skotland, (Pujade-Villar et al., 2003; Forshage et al., 2017).

Distribution in Turkey

Bayburt, Ordu (Azmaz, 2021)

Examined material

1 ♀, 5.10.2019, Görünüm; 1 ♀, 2.11.2019, Düzceli; 1 ♀, 8.10.2019, Olukman; 1 ♀,15.10.2019, Düzceli; 1 ♀, 2.11.2019, Çulhalı; 1 ♂, 5.06.2020, Olukman; 1 ♀, 2.06.2020, Sarısuvat; 1 ♀, 5.06.2020, Çulhalı; 1 ♀, 5.07.2020, Üngör; 1 ♀,15.10.2019, Emirhan; 1♀, 2.07.2020, Kiremetli; 1♀, 6.08.2020, Sarısuvat; 1 ♀, 6.08.2020, Çulhalı; 1♀,1.06.2020,

Bağlararası; 1♀, 1.06.2020, Sarısuvat; 1 ♀,1.06.2020, Nevruz; 1 ♀, 5.07.2020, Bağlararası; 1♀,1.06.2020, Çulhalı; 1 ♀,1.06.2020, Sarısuvat; 1♀,1.06.2020, Nevruz; 1 ♀, 26.05.2020, Bağlararası; 1 ♀, 26.05.2020, Bağlararası; 1 ♀, 26.05.2020, Bağlararası; 1 ♀, 26.05.2020, Bağlararası; 1 ♂, 14.05.2020, Nevruz.

Host galls

Andricus captusmedusae, *A.kollari*, *A.quercuscalicis*, *A.quercustozae*.

***Synergus ruficornis* Hartig, 1840**

Distribution

Germany, America,Andorra, Austria, Britain, Ireland, Spain, Hungary, Poland, Portugal (Pujade-Villar et al., 2003; Forshage et al., 2017).

Distribution in Turkey

Artvin, Ordu (Azmaz, 2021)

Examined material

1♂, 25.04.2020, Nevruz; 1♀,1.06.2020, Kozlu.

Host Galls: *Cynips quercusfolii*, *Trigonaspis megaptera*.

***Synergus umbraculus* (Olivier, 1791)**

Diplolepis umbraculus Olivier, 1791

S.rufipes (Boyer de Fonscolombe, 1832, *Diplolepis*)

S.orientalis Hartig, 1841

S.melanopus Hartig, 1843

S.socialis Kollar, 1843

S.punctatus Dettmer, 1924

Distribution

Germany, Andorra, Austria, Bulgaria, Great Britain, Algeria, Czech Republic, Denmark, France, Croatia, Netherlands, Ireland, Spain, Italy, Hungary, Poland, Portugal, Slovakia, Slovenia, Turkey, Ukraine, Greece (Askew et al., 2013; Katılmış and Azmaz, 2015; Melika 2006; Pujade Villar et al., 2003; Forshage et al., 2017)

Distribution in Turkey

Afyon, Bayburt, Denizli, Giresun, Gümüşhane, Ordu, İstanbul, Kütahya, Malatya, Uşak (Azmaz and Katılmış, 2017; Hellrigl and Bodur, 2015; Katılmış and Azmaz, 2015; Azmaz, 2021).

Examined material

1 ♀, 5.10.2019, Görünüm; 1 ♂, 5.10.2019, Görünüm; 1 ♀, 22.10.2019, Faraşderasi; 1 ♀, 25.10.2019, Bağlararası; 1 ♂, 23.01.2020, Nevruz; 1 ♂, 23.01.2020, Nevruz; 1 ♀, 23.01.2020, Doğanşar; 1 ♀, 23.01.2020, Faraşderasi; 1 ♀, 23.01.2020, Bağlararası; 1 ♀, 23.01.2020, Görünüm; 1 ♀, 3.03.2019, Sarısuat; 1 ♀, 3.03.2019, Faraşderasi; 1 ♂, 3.03.2019, Doğanşar; 1 ♀, 3.03.2019, Üngör; 1 ♂, 12.09.2020, Sarısuat; 1 ♂, 12.09.2020, Çulhalı; 1 ♀, 24.04.2020, Bağlararası; 1 ♀, 2.11.2019, Düzceli; 1 ♀, 2.11.2019, Çorak; 1 ♀, 25.04.2020, Sarısuat; 1 ♀, 1.06.2020, Faraşderasi; 1 ♀, 1.06.2020, Çelteki; 1 ♀, 4.05.2020, Düzceli; 1 ♂, 4.05.2020, Üngör; 1 ♀, 1.06.2020, Faraşderasi; 1 ♀, 1.06.2020, Üngör; 1 ♀, 1.06.2020, Bağlararası; 1 ♀, 1.06.2020, Emirhan; 1 ♀, 25.04.2020, Düzceli.

Host galls

Andricus captusmedusae, *A. coriarius*, *A. grossulariae*, *A. inflator*, *A. lucidus*, *A. quercuscalicis*, *A. quercustozae*, *Cynips agama*, *C. divisia*, *C. disticha*, *C. quercusfolii*. Compared to other countries in western Palearctic, the number of *Synergus* species of Turkey is thought to be rich. Although new records were listed in many provinces of Turkey, faunistic studies are still lacking in Turkey (Azmaç & Katılmış 2017; Hellrigl & Bodur 2015; Katılmış & Kıyak, 2011a, 2011b, 2011c, 2011d, Kemal and Koçak 2010; Mete & Demirsoy 2012; Mutun & Dinç 2011).

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