

Survey of Cynipid Gall Wasps (Hymenoptera, Cynipidae) in Serbia

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ABSTRACT

A list of 72 species of cynipid gall wasps that have been recorded to date in Serbia was compiled on the basis of studying cynipid fauna during the period from 2003 to 2020 and previously published data. The species *Andricus quercusramuli* (Linnaeus 1761) and *Pediaspis aceris* (Gmelin 1790) are recorded for the first time in the fauna of Serbia. The fauna of cynipid gall wasps in Serbia has still not been thoroughly studied. It is expected that about 40 to 50 species new to the fauna will be found.

Keywords: Fauna, oak, *Quercus*, gall wasp, gall-inducing insect.

INTRODUCTION

Cynipid gall wasps are small wasps (1.0 to 10.00 mm long) that create galls of different shape on trees, more rarely on herbaceous plants and shrubs. They belong to the family Cynipidae, which in addition to them also includes species that usually live as obligate inquiline in the galls of other cynipids (Melika, 2006a). With about 1400 species, cynipid gall wasps are the second largest group of gall-forming insects, after gall midges (Diptera, Cecidomyiidae) (Csóka, Stone, & Melika, 2005; Melika, 2006a). Their development involves the existence of only a sexual or an asexual generation in some species, while in others these two generations alternate cyclically. The galls they form in each generation, the host plant, the place where galls appear, and the shape, colour, structure, and size of its galls are characteristic of each species. That is why the determination can be done based on their characteristics, in addition to the morphological traits of adults. In some species, the galls they form are large and attractive and can be numbered among the most beautiful insect-created galls in the world (Melika, 2006a; Marković, 2014). Unfortunately, some species can cause damage by creating galls (Dobrosavljević, Kanjevac, & Marković, 2018; Avtzis, Melika, Matošević, & Coyle, 2018; Micik, Ozcankaya, Ocal, & Ipekdağ, 2021).

Although data on the fauna of cynipid gall wasps in Serbia can be found in the studies of a number of authors (Langhoffer, 1915; Baudyš, 1928; Pal, 1983a, 1983b; Glavendekić & Mihajlović, 2004; Drekić, 2006; Drekić et al, 2020), it can be asserted that prior to 2006 these insects were not very much investigated in Serbia, except in Vojvodina (the northern part of Serbia), where 34 species have been recorded up to that time (Langhoffer, 1915; Pal, 1983a, 1983b). Their more detailed investigation was initiated that year. Some of the data that were then obtained have been published (Marković, 2014, 2015, 2018; Stojanović & Marković, 2016, 2017; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić et al, 2020). Because the body of information about the cynipid of Serbia thereby grew considerably, the need arose to create the first summary of research conducted to date. Such a summary is also needed because it can be suspected that the number of species recorded up to now in Serbia as judged from the publications of Marković (2014, 2015, 2018) and Stojanović & Marković (2016, 2017) is imprecise. To verify whether this is the case and in view of all that has been said above, the first review of research on the fauna of cynipid gall wasps in Serbia is given in the present paper.

MATERIAL AND METHODS

The following review of research conducted to date on the cynipid gall wasps of Serbia is based on previously published data and material collected by us during the period from 2003 to 2020 at 27 localities (Table 1). Galls of cynipid gall wasps found at those localities were brought to the Laboratory of Entomology of Belgrade University's Faculty of Forestry. There they were herbarized, identified, and deposited in the herbarium of zoocecidia of the Faculty of Forestry. They were identified by Č. Marković using published works of Ionesco (1957); Eady & Quinlan (1963); Ambrus (1974); Zerova,

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Djakonchuk, & Ermolenko (1988); Csóka, Stone, & Melika (2005); Melika (2006a, 2006b); Acs, Melika, Péntes, Pujade-Villar, & Stone (2007); and Melika et al (2010). The data obtained in this way and previously published data on the fauna of cynipid gall wasps in Serbia were used to form a database from which the list of recorded species was obtained. The names of species in it were coordinated with the names given by Melika (2006a, 2006b). For every species recorded in the course of our research, the generation whose galls were found in it is given, together with the host plants. The localities mentioned in the database were grouped according to the geographic entities (mountains) or administrative units (municipalities, urban areas) to which they belong.

Table 1. List of investigated localities.

Locality	Coordinates		Locality	Coordinates	
	N	E		N	E
Alibunar			Mt. Obla Glava		
Banatski Karlovci	45°2'	21°0'	Rujevica	43°32'	21°43'
Babušnica			Mt. Rtanj		
Zvonce, Vetren	42°55'	22°34'	Šarbanovac	43°41'	21°53'
Belgrade			Novi Sad		
Boljevci, Crni Lug forest	44°42'	20°12'	Čenej	45°22'	19°48'
Progar, Bojcin Forest	44°44'	20°8'	Pećinci		
Boljevac			Kupinovo, Kupinske Grede	44°42'	19°59'
Savinac	43°54'	22°2'	Obrež	44°44'	19°58'
Deliblato Sands			Ruma		
Girls' Well	44°59'	20°57'	Hrtkovci	44°53'	19°45'
Kučevo			Platičevo	44°50'	19°46'
Mišljenovac	44°32'	21°34'	Šid		
Majdanpek			Morović	45°0'	19°13'
Debeli Lug	43°44'	22°6'	Sombor		
Debeli Lug, Felješana	44°20'	21°53'	Bukovac	45°43'	19°6'
Ravna Reka	44°26'	21°59'	Subotica		
Ujevac	44°25'	21°52'	Kelebia	46°9'	19°34'
Mt. Crni Vrh	44°8'	21°58'	Radanovac	46°7'	19°43'
Mt. Goč			Žagubica		
Brezna	43°33'	20°40'	Krepoljin, monastery Gornjak	44°15'	21°32'
Mt. Kalafat			Žagubica	44°11'	21°47'
Kamenički Vis	43°24'	21°57'			

RESULTS

Seventy species of cynipid gall wasps belonging to three tribes and 16 genera were recorded in previously published studies. Thirty-seven species from four tribes and 10 genera were registered in the course of our investigations. When all these data were entered in the database, the obtained list contained 72 species (Table 2).

Table 2. Cynipid gall wasps recorded in Serbia.

	Species	New finding/Reference
	Tribe Aylacini	
1	<i>Aulacidea hieracii</i> (Linnaeus 1758)	New finding of sexual generation: Deliblato Sands, Girls' Well 7.6.2003. on <i>Hieracium umbellatum</i> L. Reference: Pal, 1983a
2	<i>A. tragopogonis</i> (Thomson 1877)	Reference: Stojanović & Marković, 2017
3	<i>Aylax papaveris</i> (Perris 1839)	Reference: Stojanović & Marković, 2016
4	<i>Barbotinia oraniensis</i> (Barbotin 1964)	Reference: Stojanović & Marković, 2016; Marković & Stojanović, 2017
5	<i>Diastrophus mayri</i> Reinhard 1876	Reference: Marković & Stojanović, 2017
6	<i>D. rubi</i> (Bouché 1834)	Reference: Marković & Stojanović, 2017
7	<i>Liposthenes glechomae</i> (Linnaeus 1758)	Reference: Pal, 1983a
8	<i>Phanacis cichorii</i> (Kieffer 1909)	Reference: Stojanović & Marković, 2017
	Tribe Dipolepidini	
9	<i>Dipolepis eglanteriae</i> (Hartig 1840) (Fig. 1a)	New finding of sexual generation: Alibunar, Banatski Karlovci 20.10.2008. on <i>Rosa</i> sp.; Boljevac, Savinac 21.10.2011. on <i>Rosa</i> sp.; Mt. Kalafat, Kamenički Vis 10.8.2012. on <i>Rosa</i> sp. Reference: Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
10	<i>D. mayri</i> (Schlechtendal 1876)	Reference: Marković & Stojanović, 2017
11	<i>D. nervosa</i> (Curtis 1838) (Fig. 1b)	Reference: Marković 2014, 2018; Marković & Stojanović, 2017
12	<i>D. rosae</i> (Linnaeus 1758) (Fig. 1c)	New finding of sexual generation: Majdanpek, Debeli Lug 11.5.2013. on <i>Rosa</i> sp.; Mt. Crni Vrh 30.9.2011. on <i>Rosa</i> sp.; Mt. Kalafat, Kamenički Vis 29.8.2011., 10.8.2012. on <i>Rosa</i> sp.; Ruma, Hrtkovci 6.10.2011. on <i>Rosa</i> sp.; Žagubica, Krepoljin, monastery Gornjak 30.9.2011. on <i>Rosa</i> sp.; Žagubica 30.9.2011. on <i>Rosa</i> sp. Reference: Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
13	<i>D. spinosissimae</i> (Giraud 1859) (Fig. 1d,e)	Reference: Marković, 2014, 2018; Marković & Stojanović, 2017
	Tribe Pediaspidini	
14	<i>Pediaspis aceris</i> (Gmelin 1790) (Fig. 1f)	New finding of sexual generation: Majdanpek, Debeli Lug, Felješana 21.5.2010. on <i>Acer pseudoplatanus</i> L.
	Tribe Cynipini	
15	<i>Andricus amblycerus</i> (Giraud 1859) (Fig. 1g)	Reference: Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
16	<i>A. aries</i> (Giraud 1859) (Fig. 1h)	Reference: Marković & Stojanović, 2017; Drekić et al, 2020
17	<i>A. caliciformis</i> (Giraud 1859) (Fig. 1i)	New finding of asexual generation: Belgrade, Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Mt. Kalafat, Kamenički Vis 10.8.2012. on <i>Q. pubescens</i> Reference: Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Drekić et al, 2020

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Table 2. Continued.

	Species	New finding/Reference
	Tribe Aylacini	
18	<i>A. callidoma</i> (Hartig 1841) (Fig.2a)	Reference: Marković, 2014, 2015; Marković & Stojanović, 2017
19	<i>A. caputmedusae</i> (Hartig 1843) (Fig.2b)	New finding of asexual generation: Majdanpek, Ujevac 14.7.2017. on <i>Q. petraea</i> ; Žagubica 30.9.2011. on <i>Q. robur</i> Reference: Baudyš, 1928; Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Dobrosavljević et al, 2018
20	<i>A. conglomeratus</i> (Giraud 1859)	New finding of asexual generation: Pećinci, Obrež 14.2.2018. on <i>Q. robur</i> Reference: Pal, 1983b
21	<i>A. conificus</i> (Hartig 1843) (Fig.2c)	Reference: Marković, 2014; Marković & Stojanović, 2017
22	<i>A. coriarius</i> (Hartig 1843) (Fig.2d)	New finding of asexual generation: Mt. Kalafat, Kamenički Vis 10.8.2012. on <i>Q. pubescens</i> Reference: Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Drekić et al, 2020
23	<i>A. coronatus</i> (Giraud 1859) (Fig.2e)	New finding of asexual generation: Mt. Kalafat, Kamenički Vis 10.8.2012. on <i>Q. pubescens</i> ; Mt. Rtanj, Šarbanovac 11.7.2018. on <i>Q. frainetto</i> Reference: Baudyš, 1928; Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
24	<i>A. corruptrix</i> (Schlechtendal 1870)	Reference: Pal, 1983b
25	<i>A. curator</i> Hartig 1840 (Fig.2f)	New finding of sexual generation: Belgrade, Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Majdanpek, Debeli Lug, Felješana 21.5.2010. on <i>Q. petraea</i> Reference: Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković, 2014, 2015; Marković & Stojanović, 2017; Drekić et al, 2020
26	<i>A. cydoniae</i> Giraud 1859 (Fig.2g)	Reference: Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
27	<i>A. dentimitratus</i> (Rejto 1887)	Reference: Drekić et al, 2020
28	<i>A. foecundatrix</i> (Hartig 1840) (Fig.2h)	New finding of asexual generation: Belgrade, Boljevci, Crni Lug Forest 15.7.2012. on <i>Q. robur</i> ; Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Pećinci, Obrež 6.7.2017. on <i>Q. robur</i> ; Pećinci, Kupinovo, Kupinske Grede 4.5.2017. on <i>Q. robur</i> ; Ruma, Hrtkovci 6.10.2011., 9.7.2012. on <i>Q. robur</i> ; Sombor, Bukovac 19.9.2011. on <i>Q. robur</i> ; Subotica, Radanovac 19.9.2011. on <i>Q. robur</i> Reference: Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković & Stojanović, 2017
29	<i>A. galeatus</i> (Giraud 1859) (Fig.2i)	Reference: Marković, 2014, 2018; Marković & Stojanović, 2017
30	<i>A. gallaeumaeformis</i> (Boyer de Fonscolombe 1832) (Fig.3a)	Reference: Marković & Stojanović, 2017
31	<i>A. gemmeus</i> (Giraud 1859)	Reference: Pal, 1983b
32	<i>A. glutinosus</i> (Giraud 1859) (Fig.3b)	New finding of asexual generation: Babušnica, Zvonce, Vetren 10.4.2007. on <i>Q. petraea</i> ; Mt. Crni Vrh 30.9.2011. on <i>Q. petraea</i> Reference: Marković, 2014, 2015; Drekić et al, 2020
33	<i>A. grossulariae</i> Giraud 1859 (Fig.3c,d)	Reference: Marković & Stojanović, 2017
34	<i>A. hartigi</i> (Hartig 1843) (Fig.3e)	Reference: Marković, 2014, 2015, 2018
35	<i>A. hungaricus</i> (Hartig 1843) (Fig.3f)	New finding of asexual generation: Ruma, Platičevo 19.2.2020. on <i>Q. robur</i> ; Sombor, Bukovac 5.9.2014. on <i>Q. robur</i> ; Subotica, Kelebija 19.9.2011. on <i>Q. robur</i> Reference: Pal, 1983b, Marković & Stojanović, 2017
36	<i>A. inflator</i> Hartig 1840 (Fig.3g,h)	New finding of sexual generation: Belgrade, Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Novi Sad, Čenej 28.9.2012. on <i>Q. robur</i> ; Ruma, Hrtkovci 9.7.2012. on <i>Q. robur</i> Reference: Marković & Stojanović, 2017; Marković, 2018

Table 2. Continued.

	Species	New finding/Reference
	Tribe Aylacini	
37	<i>A. kollari</i> (Hartig 1843) (Fig.3i)	New finding of asexual generation: Belgrade, Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Majdanpek, Debeli Lug 16.6.2017. on <i>Q. petraea</i> ; Majdanpek, Ravna Reka 15.7.2015. on <i>Q. petraea</i> ; Novi Sad, Čenej 28.9.2012. on <i>Q. robur</i> ; Pećinci, Kupinovo, Kupinske Grede 4.5.2017. on <i>Q. robur</i> ; Pećinci, Obrež 6.7.2017. on <i>Q. robur</i> ; Ruma, Platičevo 19.2.2020. on <i>Q. robur</i> ; Subotica, Kelebija 19.9.2011. on <i>Q. robur</i> Reference: Langhoffer, 1915; Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković, 2014; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić et al, 2020
38	<i>A. lignicolus</i> (Hartig 1840) (Fig.4a)	New finding of asexual generation: Babušnica, Zvonce, Vetren 10.4.2007. on <i>Q. petraea</i> ; Majdanpek, Debeli Lug, Felješana 21.5.2010. on <i>Q. petraea</i> ; Mt. Crni Vrh 30.9.2011. on <i>Q. petraea</i> ; Pećinci, Kupinovo, Kupinske Grede 4.5.2017. on <i>Q. robur</i> Reference: Pal, 1983b; Marković, 2014, 2015; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić et al, 2020
39	<i>A. lucidus</i> (Hartig 1843) (Fig.4b)	New finding of asexual generation: Mt. Crni Vrh 30.9.2011. on <i>Q. petraea</i> ; Mt. Kalafat, Kamenički Vis 10.8.2012. on <i>Q. pubescens</i> ; Novi Sad, Čenej 28.9.2012. on <i>Q. robur</i> ; Ruma, Hrtkovci 6.10.2011. on <i>Q. robur</i> Reference: Pal, 1983b; Marković, 2014; Marković & Stojanović, 2017; Drekić et al, 2020
40	<i>A. mitratus</i> (Mayr 1870) (Fig.4c)	New finding of asexual generation: Babušnica, Zvonce, Vetren 10.4.2007. on <i>Q. petraea</i> ; Mt. Crni Vrh 30.9.2011. on <i>Q. petraea</i> Reference: Marković, 2014
41	<i>A. multiplicatus</i> Giraud 1859 (Fig.4d)	New finding of sexual generation: Ruma, Platičevo 19.2.2020. on <i>Q. cerris</i> Reference: Marković, 2014; Marković & Stojanović, 2017
42	<i>A. polycerus</i> (Giraud 1859) (Fig.4e)	New finding of asexual generation: Sombor, Bukovac 19.9.2011. on <i>Q. robur</i> Reference: Marković, 2015, 2018
43	<i>A. quercuscalicis</i> (Burgsdorf 1783) (Fig.4f)	New finding of asexual generation: Belgrade, Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Novi Sad, Čenej 28.9.2012. on <i>Q. robur</i> ; Ruma, Hrtkovci 6.10.2011. on <i>Q. robur</i> ; Ruma, Platičevo 19.2.2020. on <i>Q. robur</i> ; Sremska Mitrovica, Morović 8.10.2013. on <i>Q. robur</i> ; Subotica, Kelebija 19.9.2011. on <i>Q. robur</i> ; Žagubica 30.9.2011. on <i>Q. robur</i> Reference: Baudyš, 1928; Pal, 1983b; Marković, 2014; Marković & Stojanović, 2017; Dobrosavljević et al, 2018
44	<i>A. quercusradicis</i> (Fabricius 1798)	Reference: Marković, 2014; Marković & Stojanović, 2017
45	<i>A. quercusramuli</i> (Linnaeus, 1761) (Fig.4g)	New finding of sexual generation: Mt. Goč, Brezna 5.5.2008. on <i>Q. petraea</i>
46	<i>A. quercustozae</i> (Bosc 1792) (Fig.4h)	New finding of asexual generation: Mt. Kalafat, Kamenički Vis 29.8.2011. on <i>Q. pubescens</i> ; Mt. Rtanj, Šarbanovac 26.7.2015. on <i>Q. frainetto</i> ; Ruma, Hrtkovci 6.10.2011. on <i>Q. robur</i> ; Žagubica 30.9.2011. on <i>Q. frainetto</i> Reference: Pal, 1983b; Marković, 2014; Marković & Stojanović, 2017
47	<i>A. seckendorffi</i> (Wachtl 1879) (Fig.4i)	Reference: Marković, 2015; Marković & Stojanović, 2017
48	<i>A. solitarius</i> (Boyer de Fonscolombe 1832) (Fig.5a)	New finding of asexual generation: Mt. Crni Vrh 30.9.2011. on <i>Q. petraea</i> ; Mt. Kalafat, Kamenički Vis 29.8.2011. on <i>Q. petraea</i> and <i>Q. pubescens</i> Reference: Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Drekić et al, 2020
49	<i>A. stefanii</i> (Kieffer 1897) (Fig.5b)	New finding of asexual generation: Majdanpek, Debeli Lug 16.6.2017. on <i>Q. petraea</i> ; Mt. Rtanj, Šarbanovac 11.7.2018. on <i>Q. pubescens</i> Reference: Dobrosavljević et al, 2018; Marković, 2018
50	<i>A. superfetationis</i> (Giraud 1859) (Fig.5c)	New finding of asexual generation: Novi Sad, Čenej 28.9.2012. on <i>Q. robur</i> Reference: Marković, 2018; Marković & Stojanović, 2017

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Table 2. Continued.

	Species	New finding/Reference
	Tribe Aylacini	
51	<i>A. testaceipes</i> Hartig 1840	Reference: Pal, 1983b
52	<i>A. truncicolus</i> (Giraud 1859)	Reference: Pal, 1983b; Marković, 2015, 2018
53	<i>A. vindobonensis</i> Müllner 1901	Reference: Pal, 1983b
54	<i>Aphelonyx cerricola</i> (Giraud 1859) (Fig.5d)	New finding of asexual generation: Mt. Kalafat, Kamenički Vis 10.8.2012. on <i>Q. cerris</i> ; Žagubica, Krepoljin, monastery Gornjak 30.9.2011. on <i>Q. cerris</i> ; Žagubica 30.9.2011. on <i>Q. cerris</i> Reference: Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
55	<i>Biorhiza pallida</i> (Olivier 1791) (Fig.5e)	New finding of sexual generation: Belgrade, Boljevci, Crni Lug Forest 15.7.2012. on <i>Q. robur</i> ; Majdanpek, Debeli Lug 13.5.2013. on <i>Q. petraea</i> ; Mt. Kalafat, Kamenički Vis 29.8.2011., 10.8.2012. on <i>Q. pubescens</i> ; Pećinci, Kupinovo, Kupinske Grede 4.5.2017. on <i>Q. robur</i> Reference: Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić et al, 2020
56	<i>Callirhytis glandium</i> (Giraud 1859) (Fig.5f)	Reference: Marković & Stojanović, 2017
57	<i>Cynips agama</i> Hartig 1840	Reference: Baudyš, 1928; Pal, 1983b
58	<i>C. cornifex</i> Hartig 1843 (Fig.5g)	New finding of asexual generation: Mt. Kalafat, Kamenički Vis 29.8.2011., 10.8.2012. on <i>Q. pubescens</i> Reference: Marković, 2014, 2015, 2018
59	<i>C. longiventris</i> Hartig 1840 (Fig.5h)	New finding of asexual generation: Pećinci, Obrež 7.9.2017. on <i>Q. robur</i> ; Ruma, Hrtkovci 6.10.2011. on <i>Q. robur</i> ; Subotica, Kelebija 19.9.2011. on <i>Q. robur</i> Reference: Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković & Stojanović, 2017
60	<i>C. quercus</i> (Fourcroy 1785) (Fig.5i)	New finding of asexual generation: Mt. Kalafat, Kamenički Vis 29.8.2011. on <i>Q. pubescens</i> ; Mt. Rtanj, Šarbanovac 26.7.2015. on <i>Q. frainetto</i> ; Ruma, Platičevo 19.2.2020. on <i>Q. frainetto</i> Reference: Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić et al, 2020
61	<i>C. quercusfolii</i> Linnaeus 1758 (Fig.6a)	New finding of asexual generation: Babušnica, Zvonce, Vetren 10.4.2007. on <i>Q. petraea</i> ; Belgrade, Boljevci, Crni Lug Forest 15.7.2012. on <i>Q. robur</i> ; Novi Sad, Čenej on <i>Q. robur</i> ; Pećinci, Obrež on <i>Q. robur</i> ; Ruma, Hrtkovci 6.10.2011. on <i>Q. robur</i> ; Ruma, Platičevo 19.2.2020. on <i>Q. robur</i> ; Žagubica 30.9.2011. on <i>Q. robur</i> Reference: Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Drekić et al, 2020
62	<i>Dryocosmus cerriphilus</i> (Giraud 1859) (Fig.6b,c)	Reference: Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
63	<i>D. nitidus</i> (Giraud 1859) (Fig.6d)	New finding of asexual generation: Mt. Obla Glava, Rujevica 4.11.2008. on <i>Q. cerris</i> Reference: Marković & Stojanović, 2017
64	<i>Neuroterus albipes</i> (Schenck 1863)	Reference: Glavendekić & Mihajlović, 2004; Drekić et al, 2020
65	<i>N. anthracinus</i> (Curtis 1838) (Fig.6e)	New finding of asexual generation: Mt. Crni Vrh 30.9.2011. on <i>Q. petraea</i> ; Mt. Rtanj, Šarbanovac 26.7.2015. on <i>Q. frainetto</i> ; Novi Sad, Čenej 19.9.2011., 28.9.2012. on <i>Q. robur</i> ; Ruma, Hrtkovci 6.10.2011. on <i>Q. robur</i> ; Sombor, Bukovac 19.9.2011. on <i>Q. robur</i> ; Subotica, Kelebija 19.9.2011. on <i>Q. robur</i> ; Subotica, Radanovac 19.9.2011. on <i>Q. robur</i> ; Žagubica 30.9.2011. on <i>Q. frainetto</i> Reference: Baudyš, 1928; Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić et al, 2020
66	<i>N. minutulus</i> Giraud 1859	Reference: Pal, 1983b

Table 2. Continued.

	Species	New finding/Reference
	Tribe Aylacini	
67	<i>N. numismalis</i> (Geoffroy in Fourcroy 1785) (Fig.6f)	New finding of sexual generation: Belgrade, Boljevci, Crni Lug Forest 15.7.2012. on <i>Q. robur</i> ; Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Kučevo, Mišljenovac 30.9.2011. on <i>Q. robur</i> ; Novi Sad, Čenej 19.9.2011., 28.9.2012. on <i>Q. robur</i> ; Pečinci, Obrež 6.7.2017., 8.8.2017. on <i>Q. robur</i> ; Ruma, Hrtkovci 6.10.2011., 9.7.2012. on <i>Q. robur</i> ; Sombor, Bukovac on 19.9.2011. <i>Q. robur</i> ; Subotica, Kelebija 19.9.2011. on <i>Q. robur</i> ; Subotica, Radanovac 19.9.2011. on <i>Q. robur</i> Reference: Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković & Stojanović, 2017; Drekić et al, 2020
68	<i>N. quercusbaccarum</i> (Linnaeus 1758) (Fig.6g,h,i)	New finding of sexual generation: Pečinci, Kupinovo, Kupinske Grede 4.5.2017. on <i>Q. robur</i> ; Mt. Kalafat, Kamenički Vis 29.8.2011., 10.8.2012. on <i>Q. pubescens</i> ; Ruma, Hrtkovci 6.10.2011., 9.7.2012. on <i>Q. robur</i> ; Majdanpek, Debeli Lug 11.5.2013. on <i>Q. petraea</i> . New finding of asexual generation: Belgrade, Boljevci, Crni Lug Forest 15.7.2012. on <i>Q. robur</i> ; Progar, Bojcin Forest 15.7.2012. on <i>Q. robur</i> ; Kučevo, Mišljenovac 30.9.2011. on <i>Q. robur</i> ; Mt. Crni Vrh 30.9.2011. on <i>Q. petraea</i> ; Novi Sad, Čenej 19.9.2011., 28.9.2012. on <i>Q. robur</i> ; Pečinci, Obrež 8.8.2017. on <i>Q. robur</i> ; Rtanj, Šarbanovac 11.7.2018. on <i>Q. frainetto</i> ; Ruma, Platičevo 19.2.2020. on <i>Q. frainetto</i> ; Sombor, Bukovac 19.9.2011. on <i>Q. robur</i> ; Subotica, Kelebija 19.9.2011. on <i>Q. robur</i> ; Subotica, Radanovac 19.9.2011. on <i>Q. robur</i> ; Žagubica 30.9.2011. on <i>Q. frainetto</i> Reference: Pal, 1983b; Glavendekić & Mihajlović, 2004; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić, 2020
69	<i>N. saliens</i> (Kollar 1857)	Reference: Pal, 1983b
70	<i>N. tricolor</i> (Hartig 1841)	Reference: Baudyš, 1928
71	<i>Pseudoneuroterus macropterus</i> (Hartig 1843)	New finding of asexual generation: Žagubica 30.9.2011. on <i>Q. cerris</i> Reference: Pal, 1983b; Marković, 2014, 2015, 2018; Marković & Stojanović, 2017
72	<i>Trigonaspis megaloptera</i> (Panzer 1801)	Reference: Pal, 1983b

DISCUSSION

As indicated above, it can be seen on the basis of all the assembled data that 72 species of cynipid gall wasps belonging to 4 tribes and 17 genera have been recorded to date in Serbia. The greatest number of them were found on *Q. robur* (31 species) and *Q. petraea* (31), followed by *Q. pubescens* (21), *Q. frainetto* (19), *Q. virgiliana* (14), *Q. cerris* (11), *Rosa* sp. (5), *C. intybus* (2), *P. rhoeas* (2), *A. pseudoplatanus* (1), *G. hirsute* (1), *H. sabaudum* (1), *P. argentea* (1), and *R. hirtus* (1). Among them, 70 species were found before (Langhoffer, 1915; Baudyš, 1928; Pal, 1983a, 1983b; Glavendekić & Mihajlović, 2004; Drekić, 2006; Marković, 2014, 2015, 2018; Stojanović & Marković, 2016, 2017; Marković & Stojanović, 2017; Dobrosavljević et al, 2018; Drekić et al, 2020). In the course of our investigations, two species (*A. quercusramuli* and *P. aceris*) were recorded for the first time in the fauna of cynipid gall wasps of Serbia. Apart from them, five species new for the fauna of cynipid gall wasps of northern Serbia were found in our investigations (Ilić & Marković, 2015), together with five species new for the fauna of eastern Serbia and one species new for the fauna of western Serbia.

In terms of geography, apart from the region of Belgrade (46 species) (Marković & Stojanović, 2017), cynipid gall wasps have been most thoroughly investigated in the northern (46 species), eastern (44 species), and central (34 species) parts of Serbia. In southern and western Serbia, they have still been little studied. Cynipid gall wasps are mainly linked with oaks (Csóka et al, 2005). Since the same species of oaks are present in whole Serbia and because there is a great diversity of insects on them (Glavendekić, 2002; Marković & Stojanović, 2011, 2015, 2019; Marković, 2013; Marković, Stojanović, & Dobrosavljević, 2018; Marković, Dobrosavljević, Vujičić, & Cebeci, 2021; Stojanović, Jovanović, & Marković, 2018; Dobrosavljević, Marković, Marjanović, & Milanović, 2020), it is certain that many cynipid gall wasps will be registered in southern and western Serbia. The species that have been recorded to date in Serbia are taxa that can be expected in regions such as the ones in which they were found (Langhoffer, 1915; Ionescu, 1957; Ambrus, 1974; Kwas, 2012). The only exception is the species *B. oraniensis*, whose finding in Serbia is a surprise (Stojanović & Marković, 2016).

If the list of cynipid gall wasps in Serbia is compared with the list of species in neighbouring Hungary (Ionescu, 1957) and Romania (Ambrus, 1974), it can be concluded that it is realistic to expect that about 40 to 50 species new for the fauna of Serbia will be found. This applies especially to species that are linked with herbaceous plants, since cynipid gall wasps on them have been very little studied in Serbia (Pal, 1983a; Stojanović & Marković, 2016, 2017). Also, it is realistic to expect arrival of the harmful invasive species *Dryocosmus kuriphilus* Yasumatsu 1951 (Mick et al, 2021), which has already been recorded on the territory of neighbouring Hungary (Csóka, Wittmann, & Melika, 2009), Croatia (Matošević & Hrašović, 2013), and Bosnia-Herzegovina (Delalić, 2016).

One of the questions posed at the outset of these investigations was whether or not the number of cynipid gall wasps in Serbia given by Marković (2014, 2015, 2018) and by Stojanović & Marković (2016, 2017) is precise. Results of the present study show that it is not. According to the indicated authors, 84 species were found in Serbia at the time of their writing. That is 14 species more than the number of species (70) obtained by us in the present study on the basis of previously published data. This disagreement as to the number of species arose because: 1. The names of some species were synonyms; and 2. In one of the papers of Marković (2014), a mistake was made in stating that the number of species of cynipid gall wasps recorded up to that time was 67 instead of 57. Also, while speaking of mistakes, it should be noted that Marković and Stojanović (2017) erroneously wrote “sexual generation” instead of “asexual generation” for the species *C. glandium*.

On the basis of all that has been said, it can be concluded that with 72 species found to date, Serbia represents a region in which cynipid gall wasps have still not been thoroughly studied. For that to be achieved, about 40 to 50 species new to the fauna apparently need to be found and the regions of southern and western Serbia need to be investigated in greater detail.



Fig. 1. Galls of cynipid gall wasps. a. *Diplolepis eglanteriae* ♀♂; b. *D. nervosa* ♀♂; c. *D. rosae* ♀♂; d., e. *D. spinosissimae* ♀♂; f. *Pediaspis aceris* ♀♂; g. *Andricus amblycerus* ♀♀; h. *A. aries* ♀♀; i. *A. caliciformis* ♀♀ (sexual generation ♀♂; asexual generation ♀♀).



Fig. 2. Galls of cynipid gall wasps. a. *Andricus callidoma* ♀♀; b. *A. caputmedusae* ♀♀; c. *A. conificus* ♀♀; d. *A. coriarius* ♀♀; e. *A. coronatus* ♀♀; f. *A. curvator* ♀♂; g. *A. cydoniae* ♀♂; h. *A. foecundatrix* ♀♀; i. *A. galeatus* ♀♀.



Fig. 3. Galls of cynipid gall wasps. a. *Andricus gallaeurnaeformis* ♀♀; b. *A. glutinosus* ♀♀; c., d. *A. grossulariae*: c. ♂♂, d. ♀♀; e. *A. hartigi* ♀♀; f. *A. hungaricus* ♀♀; g., h. *A. inflator*: g. ♂♂, h. ♀♀; i. *A. kollari* ♀♀.



Fig. 4. Galls of cynipid gall wasps. a. *Andricus lignicolus* ♀♀; b. *A. lucidus* ♀♀; c. *A. mitratus* ♀♀; d. *A. multiplicatus* ♀♂; e. *A. polycerus* ♀♀; f. *A. quercuscalicis* ♀♀; g. *A. quercusramuli* ♀♂; h. *A. quercustozae* ♀♀; i. *A. seckendorffi* ♀♀.

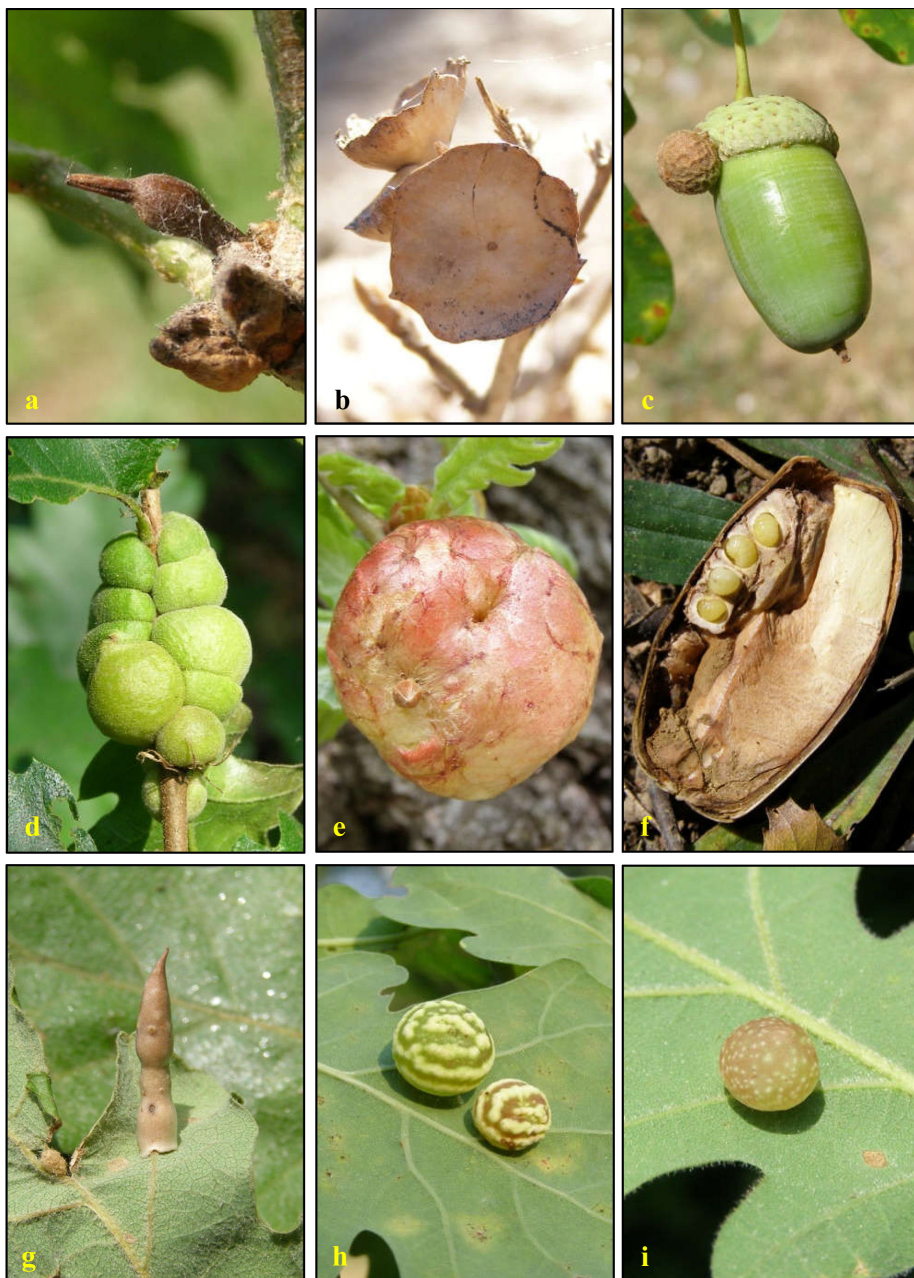


Fig. 5. Galls of cynipid gall wasps. a. *Andricus solitarius* ♀♀; b. *A. stefanii* ♀♀; c. *A. superfetationis* ♀♀; d. *Aphelonyx cerricola* ♀♀; e. *Biorhiza pallida* ♀♂; f. *Callirhytis glandium* ♀♀; g. *Cynips cornifex* ♀♀; h. *C. longiventris* ♀♀; i. *C. quercus* ♀♀.



Fig. 6. Galls of cynipid gall wasps. a. *Cynips quercusfolii* ♀♀; b., c. *Dryocosmus cerriphilus*: b. ♀♂, c. ♀♀; d. *D. nitidus* ♀♀; e. *Neuroterus anthracinus* ♀♀; f. *N. numismalis* ♀♂; g., h. i. *N. quercusbaccarum*: g., h. ♀♂, i. ♀♀.

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