

Entomology

New Date on Cynipids (Hymenoptera: Cynipoidea: Cynipidae, Cynipini, Synergini) of Georgia

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Cynipid wasps (Hymenoptera: Cynipidae) are considered to be primary pests of oaks. In the years of mass infestation, cynipids might cause even death of young plants. Cynipidae gall wasps induce some of the most structurally complex galls on oak trees and other representatives of *Fagaceae* family. This group of oak pests has not been studied for the past fifty years in Georgia. We studied Cynipidae in the oak forest of Georgia during 2020-2022. In total, we collected 13 species of gall-inducers and 2 species of inquilines. Six species are new records for the country: *Andricus coriarius* (Hartig 1843), asexual generation, *A. mammadovi* (Azmaz & Katilmis, 2021) sexual, *Cynips korsakovi* (Belizin, 1961), *C. quercus* (Fourcroy, 1785), and *C. fatehi* (Azmaz & Katilmis, 2021) asexual, and an inquiline, *Synergus gallaepomiformis* (Boyer de Fonscolombe, 1832). © 2023 Bull. Georg. Natl. Acad. Sci.

quercus, cynipidae, galls, inquilines, pest

Forests of Georgia (Sakartvelo) are characterized by a high diversity of plant species. Today, 36.7% of the territory of Georgia is covered with forests and 10.1% (291000 hectares) of it are oaks [1]. Oak forests have important soil protection and water regulation functions. Oaks are valuable for their wood and quality cork; and also serve as a resource of tannin. Oak acorns is the best food for boars and domesticated pigs and also for making coffee surrogate [2]. Six species of oak are recognized in Georgia: 1. *Quercus petraea subsp. iberica* (Steven ex Bieb, 1808); 2. *Quercus petraea subsp. Pendun-*

culiflora (K. Koch, 1849); 3. *Quercus robur subsp. imeretina* (Steven ex Woronov, 1936); 4. *Quercus pontica* (K. Koch, 1849); 5. *Quercus macranthera* (Fish & C. A. Mey. Ex Hohen, 1838); 6. *Quercus hartwissiana* (Stev, 1857) [3], however, according to the modern systematic, the validity of mentioned species is still controversial.

Oak gall wasps (Hymenoptera: Cynipidae: Cynipini) are by far the most species-rich group of gall wasps, with about 1,000 known species in about 50 genera worldwide [4]. The Hymenoptera order is one of the most divers among insect orders,

containing almost 117 000 species [5]. The Western Palaearctic of the oak gall wasp tribe Cynipini contributes 166 species in 12 genera [6]. The most species-rich region in the Western Palaearctic is Turkey, with 148 species in 25 genera and 9 tribes [7]. Much less is known about the cynipid fauna of the Transcaucasus, for which most studies were published more than 50 years ago in Armenia [8], Azerbaijan [9-12]. Earlier, twenty-three species of cynipids were identified for Georgia [13]. Since then this group of oak pests has not been studied in Georgia.

Materials and Methods

We collected material in different localities. The selection of localities was done according to the distribution of oak species and subspecies. We started to collect from June and continued until the end of October in 2020. We repeated collecting in the months of May-June and September-October during 2022. During the field work, we examined and collected the oak cynipid galls from all plant organs. We placed the visually different galls in separate containers for further rearing of adult wasps. GPS coordinates, place of collection, date, the plant species name and the collector's name have been indicated on the label. The collected material was transported to the Laboratory National Botanical Garden of Georgia. In the laboratory the obtained materials were placed in containers, jars and tubes with appropriate labels, covered with 0,5 mm or less, thin squared air-permeable tissue in order to provide aeration in the containers and not to allow development of different pathogenic fungi on the galls. We were awaited emergence of gall wasps at the room temperature. The material was kept for about 6 months, because some gall wasps and parasitoid came out later. We were checked emergence once a week. Reared wasps were put separately into tubes with 95% ethanol with an appropriate label. The insects preserved in ethanol were stored in the refrigerator. Mounted adult wasps were placed in the collection boxes with the appropriate labels. Galls were identified based on photos and

descriptions given in cynipid literature, e.g., Nieves-Aldrey (2001), Melika (2006) and many others.

Results

As the result of our investigations, we collected and identified 13 species of oak gall wasps and two species of cynipid inquiline. Below the list of species is given. New country records are marked with asterisk.

List of species

Family – Cynipidae

Genus *Andricus* Hartig, 1840

1. *Andricus curvator* (Hartig, 1840), sexual generation
Material examined: Manglisi, Algeti national park, 27.07.2020; 11.09.2020; 7.10.2020, host plant: *Quercus macranthera*. Akhaltsikhe Municipality, village Uraveli, 2.06. 2022, host plant: *Quercus macranthera*. Mtskheta municipality, village Mukhatskaro, 15.10.2020-9.11.2022, host plant: *Quercus petraea* subsp. *Iberica*. National Botanical Garden of Georgia, 26.04. 2022; 4.05. 2022; 14.05.2022, host plant: *Quercus petraea* subsp. *Iberica*.
2. *A. foecundatrix* (Hartig, 1840), asexual
Material examined: Kutaisi, Ajameti Managed Reserve, 15.09.2020, host plant: *Quercus imeretina*.
3. *A. mammadovi* (Azmaç & Katilmiş, 2021), sexual*
Material examined: Chokhatauri municipality, village Tskhratskaro, 6.11.2022, host plant: *Quercus pontica* (Fig. 1).



Fig. 1. *Andricus mammadovi* sexual gall on *Quercus pontica*, Chokhatauri municipality, village Tskhratskaro, 6.11.2022.

4. *A. coriarius* (Hartig 1843), asexual*

Materia examined: Mtskheta municipality, village-Dzegvi. 9.11.2022, host plant: *Quercus petraea* subsp. *Iberica* (Fig.2). Sagarejo municipality, village Ujarma 13.10.2022, host plant: *Quercus petraea* subsp. *Iberica*. Mtskheta municipality, village-Mukhatskaro 5.10.2022, host plant: *Quercus petraea* subsp. *Iberica*. Kutaisi-Sagoria forest, 2.09.2022, host plant: *Quercus imeretina*.



Fig. 2. *Andricus coriarius* asexual gall on *Quercus petraea* subsp. *Iberica*.

Genus Biorhiza Westwood, 18405. *Biorhiza pallida* (Olivier, 1791), sexual

Materia examined: Manglisi, Algeti national park, 27.07.2020; 11.09.2020; 7.10.2020, host plant: *Quercus macranthera*. Mtskheta municipality village Mukhatskaro, 10.09.2020-15.10.2020, host plant: *Quercus petraea* subsp. *Iberica*.

Genus Cynips Linnaeus, 17586. *Cynips divisa* (Hartig, 1840), asexual

Materia examined: Kvareli, village Gremi, 7.09.2022, host plant: *Quercus pedunculiflora*.

7. *C. korsakovi* (Belizin, 1961), asexual*

Materia examined: Manglisi, Algeti national park, 27.07.2020-11.09.2020, host plant: *Quercus macranthera* (Fig.3).

8. *C. quercus* (Fourcroy, 1785), asexual*

Materia examined: Kvareli, village Gremi, 7.09.2022- 3.10.2020, host plant: *Quercus pedunculiflora* (Fig.4).



Fig. 3. *Cynips korsakovi* asexual gall on *Quercus macranthera*.



Fig. 4. *Cynips Quercus* asexual gall on *Quercus pedunculiflora*.

9. *C. quercusfolii* (Linnaeus, 1758), asexual

Materia examined: Dmanisi Municipality, village Safarlo. 31.10.22, host plant: *Quercus macranthera*. Kvareli Municipality, village Gremi, 13.10.2020, host plant: *Quercus pedunculiflora*. Sagarejo municipality, village Ninotsminda, 12.10.2022, host plant: *Quercus petraea* subsp. *Iberica*. Shuaxevi municipality – Village Uchamba. 31.09.2020, host plant: *Quercus petraea* subsp. *Iberica*.

10. *C. fatehi* (Azmaç & Katılmış, 2021), asexual*

Materia examined: Chokhatauri municipality, village Tskhratskaro, 6.11.2022, host plant: *Quercus pontica* (Fig. 5).



Fig. 5. *Cynips fatehi* asexual gall on *Quercus pontica*.

Genus *Neuroterus* Hartig, 1840

11. *Neuroterus anthracinus* (Curtis, 1838), asexual
Materia examined: Kutaisi, Ajameti Managed Rese-

rve, 5.09.20020. Host plant: *Quercus hartwissiana*.
National Botanical Garden of Georgia, 26.04. 2022.

Host plant: *Quercus petraea* subsp. *Iberica*

12. *N. numismalis* (Geoffroy in Fourcroy, 1785), asexual.

Materia examined: Kutaisi, Ajameti Managed Reserve 5.09.20020, Host plant: *Quercus hartwissiana* and *Quercus imeretina* 15.09.2020. Shuakhevi municipality Village Gobroneti 10.08.2020. Host plant: *Quercus petraea* subsp. *Iberica*. Materia Examined: sexual: Keda municipality, village-Uchamba, 31.09.2020, Host plant: *Quercus petraea* subsp. *Iberica*.

13. *N. quercusbaccarum* (Linnaeus, 1758), asexual
Materia examined: Kutaisi, Ajameti Managed Reserve, 5.09.20020, host plant: *Quercus hartwissiana*, Manglisi, Algeti national park, 27.07.2020;

Table. Oak gallwasps (Cynipini) and inquilines (Synergini) (Hymenoptera: Cynipidae) of Sakartvelo (Georgia) with the list of new records

Gallwasps species	N.&J 2020-2022	S.&Kh, 1964
<i>Andricus curvator</i> Hartig, 1840, sexual	+	+
<i>Andricus foecundatrix</i> (Hartig, 1840), asexual	+	+
<i>Andricus inflator</i> (Hartig, 1840), asexual		+
<i>Andricus pictus</i> (Hartig, 1856), asex.		+
<i>Andricus polycerus</i> (Giraud, 1859), asexual		+
<i>Andricus quercusradicis</i> (Fabricius, 1798), asex, sex.		+
<i>Andricus mammadovi</i> (Azmaç & Katilmis, 2021), sexual *	+	
<i>Andricus solitarius</i> (Fonscolombe, 1832), asexual		+
<i>Andricus testaceipes</i> (Hartig, 1840), sexual		+
<i>Andricus coriarius</i> (Hartig 1843) *	+	
<i>Biorhiza pallida</i> (Olivier, 1791), sexual	+	+
<i>Callirhytis glandium</i> (Giraud, 1859), asexual		+
<i>Cerroneuroterus lanuginosus</i> (Giraud, 1859), asexual		+
<i>Cynips divisa</i> (Hartig, 1840), asexual	+	+
<i>Cynips korsakovi</i> (Belizin, 1961) *	+	
<i>Cynips longiventris</i> (Hartig, 1840), asexual		+
<i>Cynips quercus</i> (Fourcroy, 1785), asex *	+	
<i>Cynips quercusfolii</i> (Linnaeus, 1758), asexual	+	+
<i>Cynips fatehi</i> (Azmaç & Katilmis, 2021) asexual *	+	
<i>Neuroterus albipes</i> (Schenck, 1863), asexual		+
<i>Neuroterus anthracinus</i> (Curtis, 1838) (= <i>ostreus</i>), asexual	+	+
<i>Neuroterus numismalis</i> (Geoffroy in Fourcroy, 1785) asex	+	+
<i>Neuroterus quercusbaccarum</i> (Linnaeus, 1758), asex, sex	+	+
<i>Neuroterus politus</i> Hartig, 1840 (= <i>aprilinus</i>), sexual		+
<i>Trigonaspis megaptera</i> (Panzer, 1801), asexual		+
Synergini, inquilines		
<i>Synergus radiatus</i> (Mayr, 1872)	+	+
<i>Synergus gallaepomiformis</i> (Boyer de Fonscolombe, 1832) *	+	
Total species number	13(+2)	21

11.09.2020; 7.10.2020, host plant: *Quercus macranthera*. Mtskheta municipality, village-Dzegvi, 9.11.2022, host plant: *Quercus petraea* subsp. *Iberica*. Shuaxevi municipality – Village Gobroneti. 10.08.2020-31.09.2020, host plant: *Quercus petraea* subsp. *Iberica*.

Inquilines (Synergini)

Genus Synergus Hartig, 1840

1. *Synergus radiatus* (Mayr, 1872)

Material examined: Manglisi, Algeti national park, 27.07.2020-11.09.2020, host plant: *Quercus macranthera*.

2. *S. gallaepomiformis* (Boyer de Fonscolombe, 1832)*

Material examined: Chokhatauri municipality, village Tskhratskaro, 21.10.2020, host plant: *Quercus pontica*. Manglisi, Algeti national park, 11.09.2020-

16.10.2020, host plant: *Quercus macranthera*. Shuakhevi municipality – Village Dgvani. 31.08.2020, Host plant: *Quercus petraea* subsp. *Iberica*.

Discussion

We collected total 5 genera and 15 species of gall associated insects on the oak trees. Six species are new records for Georgia. To date, a total of 27 species of cynipids have been recorded from Georgia (Table). Further research definitely will increase the oak cynipid species list of the country.

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ენტომოლოგია

საქართველოს მუხნარის მეგალე ცინიპიდების (Hymenoptera: Cynipoidea: Cynipidae, Cynipini, Synergini) განახლებული მონაცემები

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§სასურსათო უსაფრთხოების ეროვნული ოფისი, მცენარეთა სიჯანსაღის დიაგნოსტიკის ეროვნული რეფერალური ლაბორატორია, ბუდაპეშტი, უნგრეთი

(წარმოდგენილია აკადემიის წევრის გ. ალექსიძის მიერ)

ცინიპიდები წარმოადგენენ მუხის პირველად საშიშ მავნებლებს. მასიური გამრავლების წლებში ისინი იწვევენ განსაკუთრებით ახალგაზრდა მცენარეების ხმობას. მეგალე ცინიპიდები წარმოქმნიან მრავალფეროვან სპეციფიკური სახეობის გალებს მუხასა და სხვა წიფლისებრთა ოჯახის წარმომადგენლებზე. მუხის მავნებლების ეს ჯგუფი საქართველოში ბოლო ორმოცდაათი წელი აღარ შესწავლილა. ჩვენ მიერ შესწავლილ იქნა ცინიპიდენი საქართველოს მუხნარებში. სულ ჯამში შევისწავლეთ გალების წარმომქმნელი ცინიპიდების 13 და ინჰელიტების 2 სახეობა. აქედან, 6 სახეობა საქართველოსთვის პირველად რეგისტრირებული: *Andricus mammadovi* (Azmaz & Katilmiş 2021), sexual; *A. coriarius* (Hartig 1843), asexual; *Cynips korsakovi* Belizin (1961); *Cynips quercus* (Fourcroy, 1785) asexual, *C. fatehi* (Azmaz & Katilmiş, 2021) asexual; and one inquiline, *Synergus gallaepomiformis* (Boyer de Fonscolombe, 1832).

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