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### Wasps of the families Ampulicidae, Bembicidae, Bethyridae, Chrysididae, Crabronidae, Evanidae, Gasteruptidae, Heloridae, Pemphredonidae, Pompilidae, Psenidae, Sphecidae and Vespidae (Hymenoptera) of Lagodekhi protected areas, from Georgia (Sakartvelo)

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#### ABSTRACT

The wasp species composition of 13 families (Ampulicidae, Bembicidae, Bethyridae, Chrysididae, Crabronidae, Evanidae, Gasteruptidae, Heloridae, Pemphredonidae, Pompilidae, Psenidae, Sphecidae and Vespidae) was studied in the Lagodekhi Protected Areas. Collections were performed from April to November 2014. The collection method included the use of flight intercept trapping by Malaise traps. In total, 1797 individuals belonging to 94 species were collected. For the sake of outlining the newly established taxa for the country, a full reference to the previous reports on thirteen families at species level for Georgia is made. Three families, 14 genera and 57 species are new records for Georgia (Sakartvelo). The study underscores the importance of including the protected areas studied in the conservation of wasp diversity and in addition, suggests that insect diversity should be studied separately, as it does not necessarily follow the same patterns as other groups of organisms (e. g. vertebrates or plants).

**Keywords:** Insects, Malaise trap, new records, biodiversity.

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#### Introduction

Biodiversity is a crucial element in national and international legislation for the selection of territories with conservation status. A common practice, worldwide, is to limit the knowledge of the biodiversity of most protected areas, focusing primarily on plants and vertebrates. Thus, the most noticeable gap in knowledge is with respect to arthropod and in particular, to insect diversity. The vast majority of the almost 17 000 newly described species per year belongs to insects [1]. More than 1.3 million species have been identified so far. Considering this large diversity of insects and the

current rate of species loss [2,3], the identification of areas with great entomological diversity and with an abundance of endemic and/or rare species has high priority [4-6].

The Lagodekhi Protected Areas (LPA) is located on the southern slopes in the eastern part of the Greater Caucasus, the major mountain range of the Caucasus Mountain, within the northeastern limits of Georgia (figure 1). The uniqueness of the landscape of LPA, represented by a series of gorges on the mountain slope of the Greater Caucasus extending from 590 to 3 500 meters above sea level justified the creation of the protected area back in

1912 [7]. The area of the protected territory being initially of 3 500 ha increased through the time as follows: at 10 000 ha in 1935, at 14 000 ha in 1970, at 17 818 ha in 1990 until recently at a total area of 24 451 ha.

The knowledge of the wasp fauna of the LPA is fragmentary, but it dates back from the very end of XIX century. It was the Polish explorer and naturalist Ludwik Młokosiewicz who collected widely and assiduously insects from the Lagodekhi gorge at that time. It is generally known that he supplied foreign museums with botanical and zoological material gathered by himself in Lagodekhi where he stayed between 1853 and 1860 and between 1880 and 1909. Certain material of Hymenoptera gathered by Młokosiewicz in Lagodekhi had been studied at that time mostly by Octavius Radszkowsky, Ferdinand Morawitz and Andrey Semenov. As a result, a number of new wasp taxa had been described (*Chrysis analis caucasicola*; *Chrysis glycera*; *Chrysis lagodechii*; *Chrysis Sappho*; *Chrysis verae*; *Euchrum gemma*; *Psen caucasicus* among others). Unfortunately, at that period, it was not customary to label all or any individual specimens with full details of places, dates and/or collectors. Thus, much of the material gathered by Młokosiewicz had left obscure regarding the strict locations and data of origin. Due to the poor labelling, very frequently in shape of “Caucasus” or “Mlok.”, or “1893” with no plain evidence that they come from Lagodekhi these newly described or just established wasps now are considered to come from unknown place in Caucasus.

## Material and Methods

### *Study area, sampling and specimen depositories*

The study was conducted in the Kudigora mountain range on elevational transect located in the central part of Lagodekhi Protected Areas, Georgia. The transect covered a wide variety of different habitat types both of the Managed Reserve as well as the Strict Nature Reserve (figure 1). The climate of Lagodekhi district is considered as a humid subtropical climate, with significant rainfall even in the driest month. The climate here is classified as Cfa by the Köppen-Geiger system [8].

Following the standing point that the most effective means of obtaining specimens, and temporal and geographic distributional data,

particularly for active flying insects, is the use of passive collecting methods we used flight interception traps (in particular, the Malaise traps) to collect the material for study. Seven Malaise traps were located along the transect at the following points:

H1: mountain low zone – mixed mountain forest with dominant *Fageto-Carpinetum-Festucosum* (41°51.149'N; 46° 17.266'E; 666 m);

H2: mountain middle zone – mixed mountain forest with dominant *Fagetum-Nudum* (N41°51.351'N; 46°17.564'E 847 m);

H3: mountain middle zone – mixed mountain forest, with dominant *Fageto-Galiosum* (41°52.288'N; 46°18.692'E; 1351 m);

H4: mountain upper zone – broad-leaved upper montane forest, with dominant *Fagetum-Acereto-Rubosum* (41°52.964'N; 46°19.311'E; 1841 m);

H5: mountain upper zone – broad-leaved upper montane forest, with dominant *Acereto-Rubosum* (41°53.135'N; 46°19.447'E; 1902 m);

H6: subalpine zone – with dominant *Juniperetum*, (41°53.883'N; 46°20.033'E; 2230 m);

H7: alpine zone – mainly grassland with dominant *Alchemilletum* (41°54.371'N; 46°20.004'E; 2559 m alt. (see figure 1).

In forest areas the traps were positioned at small naturally open areas/forest edges with dense herbaceous vegetation. The sampling began on April 2<sup>nd</sup> 2014 and lasted in November 7<sup>th</sup> 2014, although in alpine and subalpine areas collecting began later (for the subalpine area the alpine area in May 5<sup>th</sup> and 23<sup>rd</sup>, respectively) and completed earlier (in October), due to climate conditions and altitude. Containers were filled with 80% ethanol, material was collected every 10 (±2) days and placed at first in 96% ethanol, then it was sorted, dried and pinned up. All wasp specimens collected were stored in alcohol and identified to the species levels. Study design and collecting was conducted by second author.

### *Recording standards for previously published records for Georgia*

In order to highlight the new species of the respective families for the fauna of Georgia, we have made a full reference to the previous reports on them. It is presented into ten tables concerning those families being previously recorded for the territory of Georgia. The tables were developed from original articles and do not include any web-based lists or articles giving generic names only for

the respective wasp family. An important element in the information into the tables is the quotation of the strict locations (some in Cyrillic) according to how they are mentioned in the original source. The wide range of publications on Hymenoptera from the Caucasus region often provide distribution ranges rather than explicit local records. Therefore, the presence or absence of certain species in Georgia is not always clear. In the absence of other explicit literature records the following standard was adopted for interpreting distribution ranges: species with data entries like “Caucase”, “Caucasus”, “Кавказусбеbiet”, “Transkaukasus”, “Закавказья”, “Кавказкое побережье Черного моря” were treated as unrecorded for Georgia because Georgia merely is a part of Caucasus Mountains and East Black Sea coast; in addition, it is well generally known that abundant material gathered in the past being simply published as coming from Caucasus is actually coming from Azerbaijan (e. g. from “Helenendorf”). Taxa pointed out solely with “Georgia” or “Грузия” for their range only, also are avoided because their inclusion would in many cases have been subjective (they are not supported by strict locations); thus, it is not possible to incorporate them for Georgia meaningfully. New recorded families, genera and species for Georgia are marked with an asterisk into the text.

#### **Data analysis**

We chose this ecotone in order to increase efficiency of sampling species associated exclusively with forests and meadows. At each location, a single Malaise trap was set up from early spring to the end of the vegetation season to collect Encyrtidae. Samples we collected every 10 days resulted in a total of 1080 trap-days, with 190 trap-days at the lowest (665 m) and 130 trap-days at the highest elevation (2559 m) [9].

In each plot, we assessed the richness of vascular plants using total counts in four randomly located 10×10 m<sup>2</sup> plots within an area of 2500m<sup>2</sup> around each Malaise trap. Plant inventories were performed in May, June, and September. The Hymenopterans were identified mostly according original descriptions, redescription or diagnosis of the species. All identification except Vespidae was done by first author. Members of the family Vespidae are kindly identified by Josef Gusenleitner.

## **Results**

During the seven months of the study 1797 Hymenoptera Aculeata specimens were collected, belonging to 94 species, 46 genera, and 13 families. The hymenopteran families represented are as follows: Heloridae, Evaniidae, Gasteruptiidae, Bethyridae, Chrysididae, Pompilidae, Ampulicidae, Bembicidae, Crabronidae, Pemphredonidae, Psenidae, Sphecidae and Vespidae.

### **Family Heloridae\***

The family Heloridae embraces proctotrupoid wasps which develop as solitary larval endoparasitoids in neuropterans of the family Chrysopidae; adults emerge from the host cocoon. The single genus in the family, *Helorus* Latreille, 1802 is represented by 13 species [10]. Two species are established in LPA.

#### **Genus *Helorus* Latreille, 1802\***

*Helorus anomalipes* (Panzer, 1798)\*

Material: H3: 1♀1♂, 25.06-5.07.2014.

*H. ruficornis* A. Förster, 1856\*

Material: H1: 1♂, 4-14.06.2014; 1♀, 5-15.08; H3: 113♂♂, 25.06-5.07.2014; 5♀♀, 98♂♂, 5-15.07.2014.

#### **Species previously recorded from Georgia:**

There are no previous records of family Heloridae for Georgia.

### **Family Evaniidae**

The Evaniidae (ensign wasps) is a specialized group of parasitoids in cockroach oothecae. Twenty genera are known in the group with about 430 species. One species is established in LPA.

#### **Genus *Brachygaster* Leach, 18153.**

*Brachygaster minuta* (Oliver, 1791)

Material: H1: 1♀, 5-15.07.2014; H3: 8♂♂, 25.06-5.07.2014; 18♂♂, 5-15.07.2014; 1♀9♂♂, 25.07-5.08.2014; 5♂♂, 25.08-4.09.2014.

#### **Species previously recorded from Georgia:**

Two ensign wasp species have been reported previously from Georgia: *Brachygaster minuta* (Oliver, 1791) recorded from Akhaltsikhe, Sapari, Borjomi, Batumi, Mtsvane Kontskhi, Lagodekhi, Pitsundo-Miussersa Nature Reserve and *Prosevania fuscipes* (Illiger, 1807) recorded from Gulripsh, Sukhumi, Pitsunda [11].

## Family Gasteruptiidae\*

The Gasteruptiidae (carrot wasps) are medium-sized family with nearly worldwide distribution which contain about 550 described species. Carrot wasps, in their larval stage are predators on eggs and larvae of wild bees; once after the wild bee larva being consumed, the carrot wasp larva continues with the stored food in the nest. Two species are established in LPA.

### Genus *Gasteruption* Latreille, 1796\*

*Gasteruption assectator* (Linnaeus, 1758)\*

Material: H5: 1♀, 15-25.07.2014.

*G. diversipes* (Abeille de Perrin, 1879)\*

Material: H1: 1♀, 15-25.06.2014.

Species previously recorded from Georgia:

*Gasteruption merceti* Kieffer, 1904 has been mentioned for Lagodekhi under the name “*Gasteruption pyrenaicum*” and *Gasteruption caucasicum* (Guérin-Méneville, 1844) has been mentioned for Abasumani under the name “*Gasteruption pedemontanum*” [82].

## Family Bethylidae\*

The family Bethylidae (flat wasps) is a moderately large group of about 2 920 described species [12]. Bethylids are recognized mainly as gregarious ectoparasitoids developing on larvae of Coleoptera and Lepidoptera. Five species of flat wasps are known in LPA.

### Genus *Bethylus* Latreille, 1802\*

*Bethylus fuscicornis* (Jurine, 1807)\*

Material: H3: 1♀, 5-15.05.2014; 1♀, 15-25.07.2014.

### Genus *Epyris* Westwood, 1874\*

*Epyris bilineatus* Thomson, 1862\*

Material: H2: 1♂, 15-25.08.2014; 1♂, 25.08-4.09.2014; H3: 1♀, 25.08-4.09.2014.

*E. inermis* Kieffer, 1906\*

Material: H1: 1♀, 5-15.08.2014; H3: 1♀, 4-14.06.2014; 1♀, 5-15.08.2014; H4: 1♀, 15-25.07.2014; 1♀, 5-15.08.2014.

### Genus *Laelius* Ashmead, 1893\*

*Laelius fulvipes* Kieffer, 1906\*

Material: H1: 1♂, 4-14.09.2014.

### Genus *Pseudisobrachium* Kieffer, 1904\*

*Pseudisobrachium subcyaneum* (Halyday, 1838)\*

Material: H2: 6♂♂, 25.08-4.09.2014; 22♂♂, 4-14.09.2014; 1♂, 15-27.09.2014; 9♂♂, 27.09-6.10.2014.

### Species previously recorded from Georgia:

There are no previous records of family Bethylidae for Georgia.

## Family Chrysididae

The family Chrysididae (cuckoo wasps) contains more than 3 200 species worldwide. Cuckoo wasps are parasitoids of the eggs or of the mature larvae or are cleptoparasites in the nests of various insects from the orders Phasmatodea, Lepidoptera and Hymenoptera.

Chrysididae are one of the families of Hymenoptera with high number of species reported from Georgia. The group of cuckoo wasps is one of the earliest detected Hymenoptera Aculeata in that country [13]. A notable example for a large species spectrum at local level is the posthumous paper of Andrey Petrovich Semenov [14], where he described 16 new species of Chrysididae from Georgia. The previous studies of the cuckoo wasps provide up to now 54 established species. Eight species were recorded during survey LPA.

### Genus *Chrysis* Linnaeus, 1767

*Chrysis fasciata* Olivier, 1790\*

Material: H1: 1♀, 24.05-4.06.2014; 1♀, 25.06-5.07.2014; H2: 1♀, 4-14.06.2014; 1♀, 5-15.07.2014; 1♀, 15-25.07.2014.

*C. ignita* (Linnaeus, 1758)

Material: H1: 2♀♀, 2-12.04.2014; 3♀♀, 12-23.04.2014; 3♀♀, 23.04-4.05.2014; 3♀♀, 5-15.05.2014; 1♀, 15-24.05.2014; 1♀, 24.05-4.06.2014; 1♀, 15-25.06.2014; H2: 1♀, 12-23.04.2014; 2♀♀, 4-14.06.2014; 2♀♀, 4-14.09.2014; H3: 3♀♀, 5-15.05.2014; 4♀♀, 15-24.05.2014; 1♀, 24.05-4.06.2014; 1♀, 25.06-5.07.2014; 2♀♀, 5-15.08.2014; 1♀♀, 25.08-4.09.2014; 2♀♀, 4-14.09.2014; H4: 1♀, 15-25.07.2014; H5: 1♀, 25.06-5.07.2014; H5: 3♀♀, 5-15.08.2014; 1♀, 25.08-4.09.2014; H6: 1♀, 24.05-4.06.2014.

*C. hungarica* Scopoli, 1770\*

Material: H2: 1♀, 25.08-4.09.2014.

### Genus *Cleptes* Latreille, 1802

*Cleptes semiauratus* (Linnaeus, 1761)\*

Material: H2: 1♂, 4-14.06.2014; H3: 2♂♂, 4-14.06.2014; 4♂♂, 15-25.06.2014; 1♂, 25.06-5.07.2014; 2♂♂, 5-15.07.2014; H6: 1♂, 15-25.06.2014.

### Genus *Pseudomalus* Ashmead, 1902

*Pseudomalus auratus* (Linnaeus, 1758)

Material: H1: 1♀, 5-15.05.2014; H3: 1♀ 4-14.06.2014; 1♀, 15-25.06.2014.

*P. pusillus* (Fabricius, 1804)

Material: H1: 1♀, 5-15.05.2014; 1♀, 24.05-4.06.2014; 1♂, 4-14.09.2014.

*P. violaceus* (Scopoli, 1763)

Material: H3: 1♀, 23.04-4.05.2014.

### Genus *Trichrysis* Lichteinstein, 1876

*Trichrysis cyanea* (Linnaeus, 1758)

Material: H1: 1♀, 23.04-4.05.2014; 2♀♀, 5-15.05.2014; 10♀♀, 15-24.05.2014; 8♀♀, 24.05-4.06.2014; 4♀♀, 15-25.06.2014; 4♀♀, 25.06-5.07.2014; 5♀♀, 5-15.07.2014; 2♀♀, 15-25.07.2014; 1♀, 25.07-5.08.2014; 2♀♀, 5-15.08.2014; 3♀♀, 4-14.09.2014; H2: 2♀♀, 5-15.05.2014; 1♀, 15-24.05.2014; 4♀♀, 24.05-4.06.2014; 1♀, 4-14.06.2014; 4♀♀, 15-25.06.2014; 3♀♀, 5-15.07.2014; 5♀♀, 15-25.07.2014; 1♀, 15-25.08.2014; 5♀♀, 25.08-4.09.2014; 4♀♀, 4-14.09.2014; 2♀♀, 15-27.09.2014; H3: 1♂, 5-15.07.2014; 2♀♀, 15-24.05.2014; 4♀♀, 24.05-4.06.2014; 1♀, 4-14.06.2014; 3♀♀, 15-25.06.2014; 1♀, 25.06-5.07.2014; 2♀♀, 5-15.07.2014; 3♀♀, 25.07-5.08.2014; 1♀, 5-15.08.2014; 9♀♀, 25.08-4.09.2014; 2♀♀, 4-14.09.2014; H4: 1♀, 5-15.08.2014; H5: 1♀, 25.06-5.07.2014; 2♀♀, 15-25.07.2014; 1♀, 5-15.08.2014; H7: 1♀, 25.07-5.08.2014.

### *Species previously recorded from Georgia:*

*Chrysis albanica* W. Trautmann, 1927, recorded from Kojori [15,16]; *C. angustifrons* Abeille de Perrin, 1878, recorded from Lagodekhi [14,17], Kojori [14]; *C. bicolor* Lepeletier de Saint-Fargeau, 1806, recorded from Kojori [16]; *C. caucasicola* Balthasar, 1953, recorded from Kojori and Lagodekhi [14]; *C. cingulicornis* A. Förster, 1853, recorded from Lagodekhi [16]; *C. coeruleiventris* Abeille de Perrin, 1878, recorded from Lagodekhi [14] (Semenov-Tian-Shanskij 1967); *C. comparata* Lepeletier de Saint-Fargeau, 1806, recorded from Gudauri, Pasanauri [13]; *C. distincta* Mocsáry, 1887, recorded from Alazani valley [16]; *C. eldari* [18], recorded from Eldari [18]; *C. erivanesis* Radoszkowski, 1879, recorded from Kazbegi [17,19]; *C. frivaldszkyi* Mocsáry, 1882, recorded from Tbilisi [16]; *C. glasunovi* Semenov, 1967, recorded from Lagodekhi [16]; *C. graelsii* Guérin-Méneville, 1842, recorded from Tbilisi [19]; *C. ignita* (Linnaeus, 1758), recorded from Borjomi [20]; *C. indigotea* Dufour & Perris, 1840, recorded from Telavi [14]; *C. kolazyi* Mocsáry, 1889, recorded

from Tbilisi [13]; *C. lyda* Rosa, 2017, recorded from Pitsunda [15]; *C. mirabilis* Radoszkowski, 1877, recorded from Lagodekhi [14], Khando, Akhalkalaki [16]; *C. mokrousovi* Rosa, 2017, recorded from Akhali Atoni [15]; *C. mutabilis* Du Buysson, 1887, recorded from Lagodekhi [16]; *C. placida* Mocsáry, 1879, recorded from Lagodekhi [21]; *C. rutilans* Olivier, 1790, recorded from Tbilisi [22]; *C. soror* Dahlbom, 1854, recorded from Tbilisi [14]; *C. subsinuata* Marquet, 1879, recorded from Tbilisi [16]; *Chrysura cuprea* (Rossi, 1790), recorded from Abkhazeti [23] (Radoszkowsky 1866); *C. dichroa* (Dahlbom, 1854), recorded from Tbilisi [20] (Radde 1899); *C. ignifrons* (Brullé, 1833), recorded from Borjomi [14] (Semenov-Tian-Shanskij 1967); *C. lampa* (Semenov-Tian-Shanskij, 1967), recorded from Lagodekhi, Tbilisi [14]; *C. nikolaji* Rosa, 2017, recorded from Pitsunda [14]; *C. radians* (Harris, 1776), recorded from Tbilisi [20]; *C. simplex* (Dahlbom, 1854), recorded from Lomis mta [20]; *C. varicornis* (Spinola, 1838), recorded from Tbilisi [19]; *Cleptes ignidorsum* Móczár, 1998, recorded from Lagodekhi [24]; *C. radoszkowskii* Mocsáry, 1889, recorded from Lagodekhi [22]; *C. splendidus* (Fabricius, 1794), recorded from Kojori [16,22,25]; *Elampus pliginskii* (Semenov-Tian-Shanskij, 1967), recorded from Tbilisi surroundings [14]; *E. spina* (Lepeletier de Saint-Fargeau, 1806), recorded from Lagodekhi [16]; *Hedychridium dzhanelidzei* Semenov-Tian-Shanskij, 1967, recorded from Tbilisi [16], Tbilisi surroundings [14]; *H. gemma* (Semenov-Tian-Shanskij, 1967), recorded from Lagodekhi [14]; *H. roseum* (Rossi, 1790), recorded from Lagodekhi [14]; *H. satunini* Semenov-Tian-Shanskij, 1967, recorded from Tbilisi surroundings [14]; *H. satunini* Semenov-Tian-Shanskij, 1967, recorded from Tbilisi [16]; *Hedychrum luculentum* A. Förster, 1853, recorded from Kojori, Tbilisi surroundings [14]; *H. gerstaeckeri* Chevrier, 1869, recorded from Kojori, Lagodekhi [16]; *H. rutilans* Dahlbom, 1854, recorded from Lagodekhi [16]; *H. virens* Dahlbom, 1854, recorded from Lagodekhi [16]; *Holopyga raziborskii* Semenov-Tian-Shanskij, 1967, recorded from Kojori, Tbilisi, Lagodekhi [14]; *Omalus aeneus* (Fabricius, 1787), recorded from Gomi (Gori), Lagodekhi [16]; *Philoctetes bogdanovii* (Radoszkowski, 1877), recorded from Tbilisi [20]; *Ph. kuznetsovi* (Semenov, 1932), recorded from Kojori [26]; *Pseudomalus auratus* (Linnaeus, 1758), recorded from Tbilisi [20], Borjomi [27]; *P. pusillus* (Fabricius, 1804), recorded from Tbilisi

[20]; *P. violaceus* (Scopoli, 1763), recorded from Atskuri [16](Rosa et al. 2019); *Stilbum calens* (Fabricius, 1781), recorded from Samegrelo, Tetra aragvi shores, Kazbegi mountain [23]; *Trichrysis cyanea* (Linnaeus, 1758), recorded from Mtirala National Park [28].

## Family Pompilidae

Family Pompilidae (spider wasps) is a cosmopolitan (predominantly tropical) group of wasps containing about 4 440 described species. Spider wasps are solitary predators on arachnids (predominantly Araneae); the spider wasp larva develops upon a single paralyzed prey in a concealed environment. Previous studies (from four sources only) of the spider wasps provide up to now 20 species to occur in Georgia. Twenty-five spider wasp species are established in LPA.

### Genus *Agenioideus* Ashmead, 1902

*Agenioideus cincitellus* (Spinola, 1807)\*

Material: H1: 3♂♂, 15-24.05.2014; 21♂♂, 23.05.-4.06.2014; 7♂♂, 4-14.06.2014; 4♂♂, 15-25.06.2014; 4♂♂, 25.06-5.07.2014; 2♂♂, 15-25.07.2014; 6♂♂, 25.07-5.08.2014; H2: 10♂♂, 25.05-4.06.2014; 9♂♂, 15-25.07.2014; 10♂♂, 15-25.08.2014; 17♂♂, 15-25.06.2014; 15♂♂, 5-15.07.2014; 1♂, 15-25.06.2014; 5♂♂, 4-14.06.2014; 2♂♂, 25.08-4.09.2014; H3: 1♂, 23.05-4.06.2014; H4: 7♂♂, 5-15.08.2014.

*A. sericeus* (Vander Linden, 1827)\*

Material: H2: 1♀, 25.05-4.06.2014; 2♀♀, 2♂♂, 4-14.06.2014; 1♂, 15-25.06.2014; 1♀, 5-15.07.2014; 1♀, 5-15.08.2014; 1♂, 15-25.08.2014.

*A. usurarius* (Tournier, 1889)\*

Material: H2: 1♂ 15-25.06.2014.

### Genus *Anoplius* Dufour, 1834

*Anoplius nigerrimus* (Scopoli, 1763)\*

Material: H1: 2♂♂, 5-15.05.2014; 5♂♂, 15-25.05.2014; 2♀♀, 11♂♂, 23.05-4.06.2014; 2♂♂, 4-14.06.2014; 1♀, 3♂♂, 15-25.06.2014; 2♂♂, 15-25.07.2014; 1♀, 25.07-5.08.2014; 2♀♀, 2♂♂, 15-25.08.2014; H2: 10♂♂, 15-25.05.2014; 1♀, 23♂♂, 25.05-4.06.2014; 6♂♂, 4-14.06.2014; 2♀♀, 4♂♂, 15-25.06.2014; 1♀, 15-25.07.2014; 1♂, 4-14.09.2014; H3: 1♂, 15-25.05.2014.

*A. viaticus* (Linnaeus, 1758)

Material: H2: 1♀, 12-23.04.2014.

### Genus *Arachnospila* Kincaid, 1900\*

*Arachnospila alpivaga* (Kohl, 1888)\*

Material: H2: 1♂, 25.05.-4.06.2014; 1♂, 4-14.06.2014; 1♂, 15-25.07.2014.

*A. fuscomarginata* (Thomson, 1870)\*

Material: H1: 1♂, 5-15.05.2014; 1♂, 25.05.-4.06.2014; 1♀, 4-14.06.2014; 1♀, 6♂♂, 15-25.06.2014; 1♀, 25.06-5.07.2014; 1♀, 25.07-5.08.2014; H2: 1♂, 25.05-4.06.2014; 10♂♂, 4-14.06.2014; 11♂♂, 15-25.06.2014; H3: 1♀, 4-14.06.2014; 1♀, 15-25.06.2014; 1♀, 4♂♂, 25.06-5.07.2014; 1♀, 6♂♂, 5-15.07.2014; H5: 1♂, 15-27.09.2014.

*A. sogdianoides* (Wolf, 1964)\*

Material: H1: 2♂♂, 4-14.06.2014.

### Genus *Auplopus* Spinola, 1841

*Auplopus carbonarius* (Scopoli, 1763)

Material: H1: 1♀, 23.04-4.05.2014; 2♀♀, 5-15.05.2014; 3♂♂, 15-24.05.2014; 1♀, 11♂♂, 24.05.-4.06.2014; 1♀, 8♂, 4-14.06.2014; 1♀, 2♂, 15-25.06.2014; 2♀♀, 25.06-5.07.2014; 2♂♂, 5-15.07.2014; 1♂, 25.07-5.08.2014; 1♀, 15-27.09.2014; H2: 5♀♀, 5-15.05.2014; 1♂, 15-25.05.2014; 3♀♀, 5♂♂, 25.05.-4.06.2014; 4♀♀, 2♂♂, 4-14.06.2014; 1♀, 5-15.07.2014; 3♀♀, 15-25.08.2014; 1♀, 25.08.-4.09.2014; 1♀, 15-27.09.2014; H3: 1♂, 23.05.-4.06.2014, 3♀♀, 25.07-5.08.2014; 1♀, 5-15.08.2014; 4♀♀, 25.08-4.09.2014; H4: 1♀, 5-15.07.2014.

### Genus *Caliadurgus* Pate, 1946\*

*Caliadurgus fasciatellus* (Spinola, 1807)\*

Material: H1: 1♀, 4-14.06.2014; H2: 1♀, 5-15.05.2014; 1♀, 1♂, 15-25.05.2014; 1♀, 1♂, 25.05.-4.06.2014; 1♀, 4-14.06.2014; 1♀, 15-25.06.2014; 1♀, 15-25.07.2014; 1♂, 15-25.08.2014; 2♀♀, 4-14.09.2014; 1♀, 15-27.09.2014.

### Genus *Ceropales* Latreille, 1796

*Ceropales pygmaea* Kohl, 1880\*

Material: H1: 1♀, 15-25.07.2014; 1♀, 25.07.-5.08.2014.

### Genus *Cryptocheilus* Panzer, 1806

*Cryptocheilus freydessneri* (Kohl, 1883)\*

Material: H1: 1♀, 25.07-5.08.2014; H2: 2♂♂, 15-25.06.2014; 4♀♀, 15-25.07.2014; 1♀, 15-25.08.2014; H4: 1♀, 5-15.08.2014.

*C. notatus* (Rossi, 1792)

Material: H1: 1♀, 4-14.06.2014; H2: 1♀, 15-25.06.2014; 2♀♀, 5-15.07.2014; 2♀♀, 15-25.07.2014.

### Genus *Deuteragenia* Sustera, 1912\*

*Deuteragenia austriaca* Wolf, 1964\*

Material: H3: 1♀, 15-25.06.2014; 1♀, 25.06-5.07.2014.

*D. bifasciata* (Geoffroy, 1785)\*

Material: H1: 1♀, 5-15.05.2014; 1♂, 23.05.-4.06.2014; H2: 2♀♀, 15-25.05.2014; 1♀, 25.05.-

4.06.2014; 1♂, 5-15.09.2014; H3: 1♂, 5-15.05.2014; 1♂, 5-15.07.2014; 1♀, 1♂, 5-15.08.2014; 1♀, 25.08-4.09.2014.

*D. subintermedia* (Magretti, 1886)\*

Material: H1: 2♂♂, 23.05.-4.06.2014; 1♂, 4-14.06.2014; 1♂, 25.06.-5.07.2014; H2: 1♀, 1♂, 15-25.05.2014; 2♂♂, 23.05.-4.06. 2014; 1♂, 15-25.06. 2014; 1♀, 2♂♂, 5-15.07.2014; H3: 2♀♀, 3♂♂, 23.05.- 4.06.2014; 2♀♀, 1♂, 15-25.06.2014; 1♂, 5-15.07.2014; 1♂, 25.07.-5.08.2014; 1♀, 7♂♂, 5-15.08.2014; 5♂♂, 25.08.-4.09.2014; 1♂, 5-15.08.2014.

*D. variegata* (Linnaeus, 1758)\*

Material: H2: 1♀, 5-15.05.2014; 1♂, 25.05-4.06.2014; 1♂, 4-14.06.2014; 1♀, 15-27.09.2014; H3: 1♂, 15-25.06.2014; 2♂♂, 25.06.-5.07.2014; 1♂, 5-15.08.2014.

**Genus *Dicyrtomellus* Gussakovskij, 1935**

*Dicyrtomellus kizilkumi* (Radoszkowski, 1877)\*

Material: H1: 8♀♀, 23.04.-4.05.2014; 2♀♀, 5-15.05.2014; H2: 2♂♂, 15-25.07.2014; 12♂♂, 25.08-4.09.2014; 2♂♂, 5-15.09.2014; 1♀, 5-15.05.2014; H3: 1♂, 5-15.07.2014; 1♀, 5-15.08.2014; H4: 4♂♂, 5-15.08.2014; H7 1♀, 15-25.08.2014.

**Genus *Episyron* Schiødte, 1837**

*Episyron arrogans* (F. Smith, 1873)\*

Material: H2: 2♀♀, 25.05.-4.06.2014; 1♂, 1♀, 15-25.06.2014; 1♂, 5-15.07.2014; 1♂, 15-25.07.2014.

**Genus *Poecilagenia* Haupt, 1927\***

*Poecilagenia rubricans* (Lepelletier de Saint-Fargeau, 1845)\*

Material: H1: 3♂, 4-14.06.2014; 1♂, 23.06.-5.07.2014; H2: 3♂♂, 15-25.08.2014; 1♀, 5-14.09.2014.

**Genus *Priocnemis* Schiødte, 1837**

*Priocnemis coriacea* Dahlbom, 1843\*

Material: H1: 4♂♂, 2-12.04.2014; 1♀, 5♂♂, 12-23.04.2014; 1♀, 1♂, 23.04.-4.05.2014; H2: 3♂♂, 4-14.09.2014.40.

*P. exaltata* (Fabricius, 1775)\*

Material: H1: 2♂♂, 24.05.-4.06.2014; 2♂♂, 4-14.06.2014; 2♂♂, 15-25.06.2014; 4♀♀, 22♂♂, 25.06.-5.07.2014; 3♂♂, 5-15.07.2014; 4♀♀, 4♂♂, 25.07.-5.08.2014; H2: 1♂, 15-25.06.2014.

*P. fastigiata* Haupt, 1934\*

Material: H3: 1♀, 15-25.06.2014.

*P. parvula* Dahlbom, 1845\*

Material: H1: 4♂♂, 25.06.-5.07.2014.

*P. perturbator* (Harris, 1780)

Material: H1: 1♀, 37♂♂, 2-12.04.2014;

12♀♀, 13♂♂, 12-23.04.2014; 2♀♀, 1♂, 23.04-4.05.2014; 1♀, 5-15.05.2014. H2 1♀, 7♂♂, 12-23.04.2014. H3: 3♂♂, 12-23.04.2014; 1♀, 4♂♂, 23.04.-4.05.2014.

**Species previously recorded from Georgia:**

*Aporinellus sexmaculatus* (Spinola, 1806), recorded from Tbilisi [29,30]; *Anoplius viaticus* (Linnaeus, 1758), recorded from river Iori valley [31]; *Aporinellus moestus* (Klug, 1834), recorded from Lagodekhi, Tbilisi [29]; *Arachnospila anceps* (Wesmael, 1851), recorded from Batumi [30]; *Auplopus carbonarius* (Scopoli, 1763), recorded from Tbilisi [30]; *Auplopus rectus* (Haupt, 1926), recorded from Tbilisi [30]; *Ceropales cribrata* A. Costa, 1881, recorded from Tbilisi [32]; *Cryptocheilus egregius* (Lepelletier de Saint-Fargeau, 1845), recorded from Borjomi [20], Tbilisi [30] (Wolf *et al.* 2009); *C. notatus* (Rossi, 1792), recorded from Tbilisi [30]; *C. richardsi* Móczár, 1953, recorded from Tbilisi [30]; *C. rubellus* (Eversmann, 1846), recorded from Tbilisi [30]; *C. versicolor* (Scopoli, 1763), recorded from Tbilisi [30]; *Dicyrtomellus argenteus* Wahis, 1982, recorded from Tbilisi [30]; *Eoferreola manicata* (Pallas, 1771), recorded from Tbilisi [30]; *Episyron rufipes* (Linnaeus, 1758), recorded from Tsagveri [31]; *Evagetes crassicornis* (Shuckard, 1837), recorded from Adigeni [31]; *Pompilus cinereus* (Fabricius, 1787), recorded from Pitsunda, Tbilisi, Akhali Atoni [30]; *Priocnemis fallax* Verhoeff, 1922, recorded from Mtskheta, Tbilisi [30]; *P. perturbator* (Harris, 1780), recorded from Lagodekhi [33]; *P. pusilla* Schiødte, 1837, recorded from Tbilisi [30]; *P. sulci* Balthasar, 1943, recorded from Tbilisi [30].

**Family Ampulicidae**

Ampulicidae (cockroach wasps) are a small (about 210 described species), principally a tropical group of wasps perying Blattodea. The female ampulicid wasp stings the prey to induce paralysis, and then stores it into a preexisting cavity where laid its egg. Up to now only one cockroach wasp species has been reported from Georgia. One species are established in LPA.

**Genus *Dolichurus* Latreille, 1809**

*Dolichurus corniculatus* (Spinola, 1807)\*

Material: H1: 1♂, 15-25.05.2014; 1♂, 15-25.06.2014. H2: 1♀, 25.05-4.06.2014; 1♂, 15-25.06.2014; 1♀, 7♂♂, 5-15.07.2014; 1♀, 1♂, 15-25.07.2014; 3♂♂, 15-25.08.2014; 2♂♂, 25.08-4.09.2014; H3: 1♂, 25.08-4.09.2014.

Species previously recorded from Georgia:

*Dolichurus haemorrhous* A. Costa, 1886, recorded from Gudauta district, near Akhali Atoni [34].

### Family Bembicidae

The Bembicidae are predatory ground-nesting wasps, inhabiting mostly in sandy areas (except for the cleptoparasitic genera and for genus *Argogorytes*, latter nesting in rotten wood); they are solitary nest provisioners with prey of different insect orders (mainly Hemiptera and Diptera). The family comprises about 1 680 species; their greatest diversity occurs in the desert and semiarid regions of the world; the latter circumstance explains their small number for Georgia (both for Lagodekhi and elsewhere in the country). Previous studies of the sand wasps provide up to now 18 species to occur in Georgia. Four species are established in LPA.

#### Genus *Argogorytes* Ashmead, 1899

*Argogorytes mystaceus* (Linnaeus, 1761)\*

Material: H5: 1♀, 25.06.-5.07.2014.

#### Genus *Bembecinus* A. Costa, 1859

*Bembecinus tridens* (Fabricius, 1781)

Material: H1: 1♂, 15-25.08. 2014.

#### Genus *Gorytes* Latreille, 1804

*Gorytes laticinctus* (Lepelletier de Saint-Fargeau, 1832)\*

Material: H1 1♀, 15-25.07.2014.

#### Genus *Nysson* Latreille, 1802

*Nysson trimaculatus* (Rossi, 1790)

Material: H1 1♀, 25.06.-5.07 .2014; 1♀, 5-15.07.2014.

#### Species previously recorded from Georgia:

*Alysson spinosus* (Panzer, 1801), recorded from Kakheti, Lagodekhi [35]; *Ammatomus rogenhofferi* (Handlirsch, 1888), *Argogorytes fargeii* (Shuckard, 1837), recorded from Vashlovani reserve [36]; *Bembecinus hungaricus* (Frigivaldszky, 1876), recorded from Gagra district, near Gantiadi [34]; *B. tridens* (Fabricius, 1781), recorded from Mtskheta [37], Gagra district, near Gantiadi, Gudauta district near Akhali Atoni [34]; *Bembix bidentata* Vander Linden, 1829, recorded from Tbilisi [38], Gagra [39] (Nemkov 2016); *B. oculata* Panzer, 1801, recorded from Tbilisi [38], Gagra district near Gantiadi [34]; *Brachystegus scalaris* (Illiger, 1807), recorded from Tbilisi [40]; *Didineis lunicornis* (Fabricius, 1798), recorded from Gagra [34]; *Gorytes pleuripunctatus*

(A. Costa, 1859), recorded from Vashlovani reserve [41]; *G. schlettereri* Handlirsch, 1893, recorded from Mestia [42], Bakuriani [41]; *Hoplisoides punctuosus* (Eversmann, 1849), recorded from David Gareji monastery [43]; *Nysson fulvipes* A. Costa, 1859, recorded from Gagra [44], Gudauta district near Akhali Atoni [34]; *N. maculosus* (Gmelin, 1790), recorded from Tbilisi botanical garden [44]; *N. trimaculatus* (Rossi, 1790), recorded from Gagra; environs of Pitsunda [34]; *Stizoides cyanopterus* (Gussakovskij, 1928), recorded from Tbilisi [45]; *Stizus euchromus* Handlirsch, 1892, recorded from Tbilisi [46]; *Stizus rufiventris* Radoszkowski, 1877, recorded from Tbilisi [46].

### Family Crabronidae

The Crabronidae are predatory wasps, nesting in in preexisting cavities, in the ground or in twigs; the prey consists of a wide range of insects and spiders. The group is distributed around the world and embraces about 3 250 described recent species. The previous studies and records of Crabronidae for Georgia are surprisingly scarce. Considerable number of species was mentioned for Abkhazeti (Western Georgia) by Mokrousov & Popov [34]; the group includes up to now 43 established species in Georgia. Twenty-four species are established in LPA.

#### Genus *Crossocerus* Le Peletier-de-Saint-Fargeau & Brullé, 1835

*Crossocerus annulipes* (Le Peletier-de-Saint-Fargeau & Brullé, 1835)

Material: H1: 1♀, 25.07.-5.08. 2014; 1♀, 5-15.08.2014. H2: 1♂, 25.08.-4.09.2014. H3: 2♀, 15-25.06. 2014.

*C. assimilis* (F. Smith, 1856)

Material: H3: 1♀, 15-25.06.2014; 1♀, 25.06.-5.07.2014; H4: 1♂, 25.06.-5.07.2014; H6: 1♀, 25.06.-5.07.2014; H7: 1♀, 5-15.07.2014.

*C. barbipes* (Dahlbom, 1845)\*

Material: H4: 1♀, 5-15.07.2014.

*C. cetratus* (Shuckard, 1837)

Material: H1: 1♀, 25.07.-5.08.2014; H3: 1♀, 5-15.07. 2014.

*C. congener* (Dahlbom, 1844)\*

Material: H1: 3♀♀, 5.-15.05.2014; 1♀, 15.-25.05.2014; 1♀, 1♂, 15.-25.06.2014; 1♀, 15-25.07.2014, 2♀♀, 25.07.-5.08.2014; 1♀, 5-14.09.2014; H3: 2♀♀, 5-15.05.2014; 3♀♀, 15-25.05.2014; H4: 1♂, 15.-25.06.2014; 1♂, 15-25.07.2014; H6: 1♀, 15.-25.06.2014; 1♀, 15-

25.07.2014; H7: 4♀♀, 5-15.07.2014.

*C. megacephalus* (Rossi, 1790)\*

Material: H3: 1♂, 4-14.06.2014; H6: 1♀, 25.07.-5.08.2014.

*C. podagricus* (Vander Linden, 1829)\*

Material: H1: 3♀, 5-15.05.2014; 1♀, 15-25.05.2014; H3: 1♀, 5-15.07.2014.56.

*C. podagricus* (Vander Linden, 1829)\*

Material: H3: 1♀, 4-14.06.2014; 1♂, 25.06.-5.07.2014.

*C. varus* Le Peletier-de-Saint-Fargeau & Brullé, 1835\*

Material: H1: 1♀, 25.05.-4.06.2014; 1♀, 15.-25.06.2014; 1♀, 25.06.-5.07.2014; H3: 1♀, 25.05.-4.06.2014; 1♀, 4.-14.06.2014; 1♀, 15-25.06.2014; 2♀♀, 25.06.-5.07.2014; 1♀, 5-15.07.2014; H4: 1♀, 5-15.07.2014.

### Genus *Ectemnius* Dahlbom, 1845

*Ectemnius cavifrons* (Thomson, 1870)\*

Material: H2: 1♀, 15-25.05.2014; 1♀, 25.05.-4.06.2014; H4: 2♀, 25.06.-5.07.2014; 1♂, 5-15.07.2014; 2♀♀, 15-25.07.2014; 1♂, 25.08.-4.09.2014; H6: 1♀, 5-15.05.2014; 1♀, 15-25.06.2014.

*E. cephalotes* (Olivier, 1792)\*

Material: H2: 1♀, 4-14.06.2014; H3: 2♀♀, 25.05.-4.06.2014; H6: 1♀, 4-14.06.2014.

*E. lituratus* (Panzer, 1803)\*

Material: H1: 1♀, 25.05.-4.06.2014; H3: 1♀, 4-14.06.2014; 1♂, 25.07.-5.08.2014; H4: 1♀, 15.-25.06.2014; H6: 3♀♀, 15-25.07.2014.

### Genus *Entomognathus* Dahlbom, 1844\*

*Entomognathus brevis* (Vander Linden, 1829)\*

Material: H1: 1♂, 15-25.05.2014; 1♂, 4-14.06.2014; 2♀♀, 4♂♂, 25.05.-4.06.2014; 15♀♀, 9♂♂, 15-25.06.2014; 3♀♀, 1♂, 25.06.-5.07.2014; 1♂, 5-15.07.2014; H2: 2♀♀, 2♂♂, 25.05.-4.06.2014; 1♀, 15-25.06.2014; H3: 1♀, 1♂, 15-25.06.2014; 4♀♀, 7♂♂, 25.06.-5.07.2014; 1♀, 3♂♂, 5-15.07.2014.

### Genus *Miscophus* Jurine, 1807

*Miscophus bicolor* Jurine, 1807

Material: H2: 1♀, 15-25.08.2014.

### Genus *Nitela* Latreille, 1809\*

*Nitela borealis* Valkeila, 1974\*

Material: H2: 1♂, 25.08.-4.09.2014; H3: 1♀, 25.07.-5.08.2014; 1♀, 5-15.08.2014; 4♀♀, 1♂, 25.08.-4.09.2014; H4: 2♀♀, 1♂, 15-25.07.2014; H6: 1♀, 5-14.09.2014.

### Genus *Rhopalum* Stephens, 1829\*

*Rhopalum clavipes* (Linnaeus, 1758)\*

Material: H1: 1♀, 15-25.05.2014; H3:

2♀, 5-15.05.2014; 1♀, 25.05.-4.06.2014; 1♀, 25.06.-5.07.2014; 1♀, 25.07.-5.08.2014; 2♀♀, 25.08.-4.09.2014; 2♀♀, 26.08.-5.09.2014; H4: 1♀, 4-14.06.2014; 2♀♀, 2♂♂, 15-25.06.2014; 1♀, 1♂, 5-15.07.2014; 1♂, 15-25.07.2014; H6: 4♀♀, 5-15.05.2014; 1♀, 1♂, 4-14.06.2014; 1♀, 15.-25.07.2014; 4♀♀, 5.-15.08.2014; 2♀♀, 25.08.-4.09.2014; 2♀♀, 5-14.09.2014; H7: 1♀, 4-14.06.2014; 1♂, 15-25.06.2014; 1♀, 5-15.07.2014.

*R. coarctatum* (Scopoli, 1763)\*

Material: H1: 1♀, 15-25.05.2014.

### Genus *Trypoxylon* Latreille, 1796

*Trypoxylon attenuatum* F. Smith, 1851\*

Material: H1: 1♀, 15.-25.06.2014.

*T. beaumonti* Antropov, 1991\*

Material: H1: 4♀♀, 5-15.05.2014; 2♀♀, 25.05.-4.06.2014; 1♂, 15-25.06.2014; 1♀, 25.07.-5.08.2014; H2: 1♀, 15.-25.06.2014; 1♀, 15.-25.08.2014; H6: 1♀, 5.-15.05.2014.

*T. clavicum* Lepeletier de Saint-Fargeau & Audinet-Serville, 1828

Material: H3: 1♀, 25.05.-4.06.2014.

*T. fronticorne* Gussakovskij, 1936

Material: H2: 1♀, 15-25.06.2014.

*T. kolazyi* Kohl, 1893

Material: H1: 1♀, 4-14.06.2014; H2: 1♀, 25.08.-4.09.2014.

*T. minus* de Beaumont, 1945

Material: H1: 3♀♀, 23.04.-4.05.2014; 6♀♀, 1♂, 5-15.05.2014; 9♀♀, 2♂♂, 15.-25.05.2014; 1♀, 25.05.-4.06.2014; 2♀♀, 25.06.-5.07.2014; 3♀♀, 25.07.-5.08.2014; 1♀, 25.08.-4.09.2014; H2: 2♀♀, 23.04.-4.05.2014; 4♀, 1♂, 5-15.05.2014; 1♀, 15-25.05.2014; 1♀, 25.05.-4.06.2014; 1♀, 4-14.06.2014; 5♀♀, 3♂♂, 15-25.06.2014; 9♀♀, 5.-15.07.2014; 6♀♀, 15.-25.08.2014; 11♀♀, 25.08.-4.09.2014; H3: 2♂♂, 23.04.-4.05.2014; 2♀♀, 15-25.05; 2♀♀, 2♂♂, 25.05.-4.06.2014; 2♀♀, 4-14.06.2014; 2♀♀, 15-25.06.2014; 1♀, 1♂, 25.06.-5.07.2014; 1♀, 5-15.07.2014; 1♀, 25.07.-5.08.2014; 5♀♀, 2♂♂, 5-15.08; 1♂, 15-25.08.2014; 5♀♀, 4♂♂, 25.08.-4.09.2014; H4: 1♂, 25.06.-5.07.2014; 2♀♀, 5-15.08.2014; H6: 1♀, 1♂, 4-14.06.2014; 1♀, 15-25.07.2014; 1♀, 5-15.08.2014; 1♀, 5-14.09.2014; H7: 2♀♀, 5.-15.07.2014; 2♀♀, 5-15.07.2014.

*T. rubiginosum* Gussakovskij, 1936

Material: H1: 2♀♀, 5♂♂, 15-25.05.2014; 3♂♂, 25.05.-4.06.2014; 1♀, 1♂, 4-14.06.2014; 2♀♀, 1♂, 15-25.06.2014; 1♀, 25.06.-5.07.2014; 1♀, 15-25.07.2014; 3♀♀, 25.07.-5.08.2014; 1♀, 26.08.-5.09.2014; H2: 1♀, 5-15.05.2014; 1♀, 15.-

25.05.2014; H3: 1♀, 15-25.06.2014; 1♀, 25.06.-5.07.2014; 1♀, 25.07.-5.08.2014; 1♀, 5-15.08.2014; 1♀, 25.08.-4.09.2014; H4: 2♀♀, 4-14.06.2014; 2♀♀, 5-15.07.2014; 1♀, 15-25.07.2014; H6: 1♀, 5-15.05.2014; 1♀, 15-25.07.2014; 1♀, 5-14.09.2014.

#### **Species previously recorded from Georgia:**

*Crabro alpinus* Imhoff, 1863, recorded from Gagra district Mt Mamdzhishkha [34]; *Crossocerus annulipes* (Le-Peletier-de-Saint-Fargeau & Brullé, 1835), recorded from Gantiadi (Tsandripsh), Akhali Atoni [34]; *C. assimilis* (F. Smith, 1856), *C. capitatus* (Shuckard, 1837), recorded from Mestia [47]; *C. cetratus* (Shuckard, 1837), recorded from Avadhara [34]; *C. elongatulus* (Vander Linden, 1829), recorded from Gantiadi (Tsandripsh) [34]; *Ectemnius cavifrons* (Thomson, 1870), recorded from Mtirala National Park [28], Otkhara, Akhali Atoni [34]; *E. lapidarius* (Panzer, 1803), recorded from Mtirala National Park [28]; *E. nigratarsus* (Herrich-Schaeffer, 1841), recorded from Gagra [48]; *E. rubicola* (Dufour & Perris, 1840), recorded from Akhali Atoni [34]; *E. sexcinctus* (Fabricius, 1775), recorded from Borjomi [20]; *Lestica clypeata* (Schreber, 1759), recorded from Gantiadi (Tsandripsh), Akhali Atoni [34]; *Lindenius pygmaeus* (Rossi, 1794), recorded from Gantiadi (Tsandripsh) [34]; *Liris festinans* (F. Smith, 1858), recorded from Gagra, Akhali Atoni, Sokhumi district Sokhumi, Kelasuri [34]; *L. niger* (Fabricius, 1775), recorded from Alhali Atoni [34]; *Miscophus bicolor* Jurine, 1807, recorded from Gagra, Akhali Atoni [34]; *Oxybelus caucasicus* Radoszkowski, 1893, recorded from Lagodekhi [18]; *O. uniglumis* (Linnaeus, 1758), recorded from Gantiadi (Tsandripsh) [34]; *Palarus variegatus* (Fabricius, 1781), recorded from Vashlovani reserve [49], Gantiadi (Tsandripsh) [31,49, 50]; *Parapiagetia genicularis* (F. Morawitz, 1890), recorded from Lagodekhi [52]; *Pison atrum* (Spinola, 1808), recorded from Tbilisi, Sagarejo [53]; *Rhopalum austriacum* (Kohl, 1899), recorded from Akhali Atoni [31]; *Tachysphex brullii* (F. Smith, 1856), recorded from Lagodekhi [54]; *T. consocius* Kohl, 1892, recorded from Akhali Atoni [34]; *T. ferrugineus* Pulawski, 1971, recorded from Sokhumi [54], Pitsunda, Akhali Atoni [35], Sairme [55] (Straka 2016); *T. fugax* (Radoszkowski, 1877), recorded from Tbilisi 52,55], Akhali Atoni [34]; *T. helveticus* Kohl, 1885, recorded from Akhali Atoni [34]; *T. incertus* (Radoszkowski, 1877), recorded from Tbilisi [54]; *T. mediterraneus*

Kohl, 1883, recorded from Gantiadi (Tsandripsh), Gagra [34]; *T. obscuripennis* (Schenck, 1857), recorded from Gudauta district Lake Ritsa [34]; *T. pompiliformis* (Panzer, 1803), recorded from Lagodekhi [54], Akhali Atoni [31]; *T. psammobius* (Kohl, 1880), recorded from Lagodekhi [54], Gantiadi (Tsandripsh), Gagra, Mt Mamdzhishkha; Akhali Atoni [34]; *T. stachi* de Beaumont, 1936, recorded from Lagodekhi [54]; *T. unicolor* (Panzer, 1809), recorded from Tbilisi [54]; *Tachytes ambidens* Kohl, 1884, recorded from Lagodekhi [57]; *Trypoxylon clavicerum* Lepeletier de Saint-Fargeau and Audinet-Serville, 1828, recorded from Tbilisi [58], Batumi, Sokhumi [59]; *T. deceptorium* Antropov, 1991, Tamishi, Batumi, Tbilisi, Adigeni, Mtskheta [60]; *T. fronticorne* Gussakovskij, 1936, recorded from Gagra, Akhali Atoni [34]; *T. kolazyi* Kohl, 1893, recorded from Tbilisi [58]; *T. minus* de Beaumont, 1945, recorded from Akhali Atoni [34]; *T. rubiginosum* Gussakovskij, 1936, recorded from Batumi [60,61]; Primorskoe (Apkhazeti), Tbilisi, Gagra [62]; *T. scutatatum* Chevrier, 1867, recorded from Tbilisi [58].

#### **Family Pemphredonidae**

Family Pemphredonidae includes about 460 recent species of predatory wasps; they nest in soil or in twigs and prey mainly upon immature Hemiptera. Eight species (mostly from genus *Pemphredon*) have been previously recorded for Georgia. Six species of that group are established in LPA.

#### **Genus *Passaloecus* Shuckard, 1837**

*Passaloecus gracilis* (Curtis, 1834)

Material: H1: 1♀, 25.05.-4.06.2014; H2: 1♀, 15-25.06.2014; 3♀♀, 25.08.-4.09.2014; H3: 1♀, 15-25.06.2014; 1♀, 25.06.-5.07.2014; H6: 1♀, 25.06.-5.07.2014.

#### **Genus *Pemphredon* Latreille, 1796**

*Pemphredon inornata* Say, 1824\*

Material: H1: 1♀, 5-15.05.2014; 1♀, 25.05.-4.06.2014; 2♀♀, 15-25.06.2014; 1♀, 5-15.07.2014; 1♀, 15-25.08.2014; H2: 1♀, 5-15.05.2014; 1♀, 15-25.05.2014; 1♀, 25.05.-4.06.2014; H3: 1♀, 25.05.-4.06.2014; 1♀, 4-14.06.2014; 2♀♀, 5-15.07.2014; H4: 1♀, 15-25.07.2014.

*P. lugubris* (Fabricius, 1793)\*

Material: H1: 1♀, 12-23.04.2014; 2♀♀, 23.04.-4.05.2014; 1♀, 5-15.05.2014; H2: 1♀, 12-23.04.2014; H3: 1♀, 23.04.-4.05.2014; 1♀,

5-15.05.2014; 2♀♀, 15-25.05.2014; 4♀♀, 25.05.-4.06.2014; 3♀♀, 4-14.06.2014; 3♀♀, 15.-25.06.2014; 1♀, 5-15.07.2014; 1♀, 25.07.-5.08.2014; H6: 6♀♀, 4-14.06.2014; 1♀, 15-25.06.2014; 2♀♀, 25.06.-5.07.2014; 3♀♀, 15-25.07.2014; H7: 2♀♀, 2♂♂, 5-15.07.2014; 2♀♀, 1♂, 5-15.07.2014.

*P. morio* Vander Linden, 1829\*

Material: H1: 1♀, 15-25.05.2014; H3: 1♀, 5-15.08.2014.

### Genus *Spilomena* Shuckard, 1838

*Spilomena beata* Blüthgen, 1953\*

Material: H3: 3♀♀, 5-15.07.2014; 2♀♀, 25.08.-4.09.2014; H5: 1♀, 25.07.-5.08.2014; 1♀, 5-14.09.2014.

### Genus *Stigmus* Panzer, 1804\*

*Stigmus pendulus* Panzer, 1804\*

Material: H1: 1♀, 25.05.-4.06.2014; H3: 1♀, 15-25.05.2014; 1♀, 25.06.-5.07.2014.

### Species previously recorded from Georgia:

*Diodontus brevilabris* de Beaumont, 1967, recorded from Gagra district environs of Pitsunda [34]; *Passaloecus gracilis* (Curtis, 1834), recorded from Akhali Atoni [34] (Mokrousov & Popov 2016); *P. insignis* (Vander Linden, 1829), recorded from Akhali Atoni; Mt. Avadkhara [34]; *Pemphredon austriaca* (Kohl, 1888), recorded from Gantiadi (Tsandriash); environs of Pitsunda; Akhali Atoni; Sokhumi, Kelasuri Station [34]; *P. lethifer* (Shuckard, 1837), recorded from Akhali Atoni [34]; *P. lugens* Dahlbom, 1842, recorded from Mestia [63]; *P. rugifer* (Dahlbom, 1844), recorded from Akhali Atoni [35]; *Spilomena troglodytes* (Vander Linden, 1829), recorded from Akhali Atoni [34].

## Family Psenidae

Psenidae is a comparatively small family of about 580 species with worldwide distribution. These wasps are solitary predators and nest explicitly in soil; the prey includes various Hemiptera. Only three species of that group are established in LPA.

### Genus *Psenulus* Kohl, 1897

*Psenulus fuscipennis* (Dahlbom, 1843)

Material: H1: 1♀, 25.05.-4.06.2014; 1♀, 25.07.-5.08.2014; 1♀, 5-15.08.2014; H2: 2♀♀, 15-25.05.2014; H3: 1♂, 25.05.-4.06.2014; H4: 1♀, 5-15.08.2014.

*P. meridionalis* de Beaumont, 1937\*

Material: H2 1♂, 15.-25.05.2014.

### *P. pallipes* (Panzer, 1798)

Material: H1: 2♀♀, 2♂♂, 5-15.05.2014; 2♂♂, 15-25.05.2014; 4♂♂, 25.05.-4.06.2014; 1♀, 15-25.07.2014; 1♀, 25.07.-5.08.2014; 2♂♂, 5-15.08.2014; H2: 1♀, 23.04.-4.05.2014; H3: 1♀, 23.04.-4.05.2014; 4♀♀, 1♂ 5-15.05.2014; 9♀♀, 15-25.05.2014; 4♀♀, 3♂♂, 25.05.-4.06.2014; 6♀♀, 1♂, 15-25.06.2014; 5♀♀, 25.06.-5.07.2014; 3♀♀, 1♂, 5-15.07.2014; 2♀♀, 15-25.07.2014; 11♀♀, 5-15.08.2014; 1♀, 15-25.08.2014; 13♀♀, 25.08.-4.09.2014; H4: 4♀♀, 15.-25.07.2014; 1♀, 5-15.08.2014; H6: 1♀, 4♂♂, 4-14.06.2014; 2♀♀, 25.06.-5.07.2014; 1♀, 15.-25.07.2014; 1♀, 5-14.09.2014; 1♀, 5.-15.07.2014; 1♀, 5.-15.07.2014.

Species previously recorded from Georgia:

*Entomosericus concinnus* Dahlbom, 1845, recorded from 2 km SW Atskuri [64]; *Mimesa caucasica* Maidl, 1914, recorded from Lagodekhi [53]; *Mimesa crassipes* A. Costa, 1871, recorded from Tbilisi [53]; *Pseneo exaratus* (Eversmann, 1849), recorded from Gantiadi (Tsandriash); 20 km west from gagra, Leselidze, Tskaltubo, Lagodekhi reserve [65]; *Psenulus fuscipennis* (Dahlbom, 1843), recorded from Mestia [66]; *P. pallipes* (Panzer, 1798), recorded from Gantiadi (Tsandriash) [34]; *P. pan* de Beaumont, 1967, recorded from Tbilisi botanical garden [65]; *P. schencki* (Tournier, 1889), recorded from Mestia [66].

## Family Sphecidae

Sphecidae is a cosmopolitan family of about 700 species; members of the family are solitary predators/parasitoids; the prey includes arachnids or insects (Blattoptera, Orthoptera and larvae of Lepidoptera). The greatest portion of Sphecida diversity exists in the Old World, particularly in the xeric regions. In LPA Sphecidae is presented by one species so far.

### Genus *Sceliphron* Klug, 1801

*Sceliphron curvatum* (F. Smith, 1870)

Material: H4: 1♂, 25.06.-5.07.2014.

### Species previously recorded from Georgia:

*Ammophila campestris* Latreille, 1809, recorded from Georgia, not exact location is given [50]; *A. sabulosa* (Linnaeus, 1758), recorded from Mestia [67], Akhali Atoni [34]; *Palmodes melanarius* (Mocsáry, 1883), recorded from Tbilisi [67,68]; *Podalonia affinis* (W. Kirby, 1798), recorded from Tbilisi [70]; *P. caucasica* (Mocsáry, 1883),

recorded from Tbilisi [68]; *P. fera* (Lepeletier de Saint-Fargeau, 1845), Gantiadi (Tsandriphsh) [34]; *Podalonia fera* (Lepeletier de Saint-Fargeau, 1845), recorded from near Jandari [71]; *Prionyx kirbii* (Vander Linden, 1827), recorded from Gantiadi (Tsandriphsh), Akhali Atoni [34]; *P. subfuscatus* (Dahlbom, 1845), recorded from Gantiadi (Tsandriphsh) [34]; *P. viduatus* (Christ, 1791), recorded from Gantiadi (Tsandriphsh) [34]; *Sceliphron curvatum* (F. Smith, 1870), recorded from Borjomi [71], Pitsunda, Akhali Atoni [33,71]; *S. destillatorium* (Illiger, 1807), recorded from Tbilisi [66,67]; Gagra, lori river, Sagarejo [74]; *S. madraspatanum* (Fabricius, 1781), recorded from Lagodekhi [73]; *S. spirifex* (Linnaeus, 1758), recorded from Gantiadi (Tsandriphsh), Akhali Atoni [34]; *Sphex flavipennis* Fabricius, 1793, recorded from Gantiadi (Tsandriphsh), Akhali Atoni [34]; *S. funerarius* Gussakovskij, 1934, recorded from Gantiadi (Tsandriphsh) [34].

## Family Vespidae

The family Vespidae is a diverse group of hymenopterous insects exhibiting solitary, primitively social and eusocial way of life; it includes of about 4 200 described species. The members of the family construct nests, usurp nests or occupy pre-existing cavities for nesting. Most vespids are predators on other insects, however, a small group (subfamily Masarinae) supply their nests entirely with pollen and/or nectar for feeding the offspring. Fifty species of Vespidae have been previously recorded for Georgia. In LPA Vespidae are known with twelve species.

### Genus *Allodynerus* Bluethgen, 1938

*Allodynerus rossii* (Lepeletier de Saint-Fargeau, 1845)

Material: H2: 1♀, 15-25.07.2014.

### Genus *Ancistrocerus* Wesmael, 1836

*Ancistrocerus nigricornis* (Curtis, 1826)

Material: H2: 2♀, 4-14.06.2014; H3: 1♀, 15-25.05.2014; H4: 1♀, 5-15.07.2014; H5: 1♀, 15.25.06.2014; 2♀, 25.08.-4.09.2014; H6: 1♀, 25.06.-5.07.2014.

*A. trifasciatus* (O. F. Müller, 1776)

Material: H7: 1♀, 25.06-5.07.2014.

### Genus *Dolichovespula* Rohwer, 1916

*Dolichovespula media* (Retzius, 1783)

Material: H3: 1♀, 5-15.07.2014.

*D. saxonica* (Fabricius, 1793)

Material: H1: 2♀♀, 5-15.05.2014; 1♀, 15-25.06.2014; H3: 1♀, 4-14.06.2014; H4: 1♀, 5-15.05.2014; 1♀, 25.06-5.07.2014.

*D. sylvestris* (Scopoli, 1763)

Material: H1: 1♀, 23.04-4.05.2014; 1♀, 15-25.06.2014; H4: 1♀, 5-15.05.2014, 1♀, 4-14.06.2014; H6: 1♀, 5-15.07.2014.

### Genus *Odynerus* Latreille, 1802

Material: H3: 1♀, 15-25.06.2014.

### Genus *Polistes* Latreille, 1802

*Polistes dominula* (Christ, 1791)\*

Material: H1: 1♀, 15-25.06.2014; H6: 1♀, 25.07-5.08.2014; 1♂, 25.07-5.08.2014; H7: 4♀♀, 5-15.07.2014; 2♀♀, 15-25.07.2014; 1♂, 15-25.07.2014; 1♂, 25.07-5.08.2014.

*P. gallicus* (Linnaeus, 1767)

Material: H6: 1♀, 25.07-5.08.2014; 1♀, 15-25.08.2014; H7: 1♀, 15-25.07.2014; 1♀, 5-15.08.2014; 1♀, 15-25.08.2014.

### Genus *Vespa* Linnaeus, 1758

*Vespa crabro* Linnaeus, 1758

Material: H1: 1♀, 5-15.07.2014; 2♀♀, 15-25.07.2014; 2♀♀, 25.07-5.08.2014; 1♀, 5-15.08.2014; H2: 1♀, 25.05-4.06.2014.

### Genus *Vespula* Thomson, 1869

*Vespula rufa* (Linnaeus, 1758)

Material: H1: 1♀, 15-25.06.2014; 1♀, 15-25.07.2014; H4: 3♀♀, 5-15.07.2014; 1♀, 25.07-5.08.2014; H6: 4♀♀, 15-25.07.2014.

*V. vulgaris* (Linnaeus, 1758)

Material: H1: 3♀♀, 12-23.04.2014; 6♀♀, 23.04-4.05.2014; 11♀♀, 5-15.05.2014; 1♀, 15-25.05.2014; 3♀♀, 24.05-4.06.2014; 9♀♀, 4-14.06.2014; 2♀♀, 15-25.06.2014; 6♀♀, 25.06-5.07.2014; H2: 2♀♀, 23.04-4.05.2014; 2♀♀, 4-14.06.2014; 5♀♀, 15-25.06.2014; 1♀, 4-14.09.2014; H3: 1♀, 23.04-4.05.2014; 1♀, 15-25.06.2014; 1♀, 25.07-5.08.2014; 2♀♀, 5-15.08.2014; H4: 1♀, 5-15.05.2014; 2♀♀, 15-25.05.2014; 3♀♀, 4-14.06.2014; 2♀♀, 25.06-5.07.2014; 2♀♀, 5-15.07.2014; 5♀♀, 15-25.07.2014; 3♀♀, 25.08-4.09.2014; H5: 1♀, 15-27.09.2014.

### Species previously recorded from Georgia:

*Allodynerus rossii* (Lepeletier de Saint-Fargeau, 1841), recorded from Borjomi [75]; *Ancistrocerus antilope* (Panzer, 1798), recorded from Omalo, Lebarde [76]; *A. kazbekianus* (Kostylev, 1940), recorded from Stepantsminda (Kazbegi) [77]; *A. nigricornis* (Curtis, 1826), recorded from Avadkhara, Tbilisi Botanical Garden [76]; *A. oviventris* (Wesmael, 1836), recorded from Gudauri

[75], Omalo [76]; *A. terekensis* (Kostylev 1940), recorded from Stepantsminda (Kazbegi) [77]; *A. trifasciatus* (O. F. Müller, 1776), recorded from Pasanauri [75]; *Antepipona cribrata* (F. Morawitz, 1885), recorded from Lagodekhi [76]; *Antepipona deflenda* (S. Saunders, 1853), recorded from Akhaltsikhe [75]; *Celonites tauricus* Kostylev, 1935 recorded from Stepantsminda (Kazbegi) [20]; *Delta unguiculatum* (de Villers, 1789), recorded from Borjomi [20]; *Delta unguiculatum* (de Villers, 1789), recorded from Nasakirali mineral waters, Tbilisi Surroundings, Kulbaki, Sokhhumi [76]; *Dolichovespula adulterina* (du Buysson, 1905), recorded from Nikortsmda, Tlugi, Chrebalo [76]; *D. media* (Retzius, 1783); recorded from Ushguli, Tskhneti [76]; *D. norwegica* (Fabricius, 1781), recorded from Ushguli, Tsana [76]; *D. omissa* (Bischoff, 1931), recorded from Stepantsminda (Kazbegi), Lebarde [76]; *D. saxonica* (Fabricius, 1793), recorded from Kojori [77], Avadkhara, Omalo, Gurshevi, Nikortsmda, Tlugi, Tsana, Tsageri, Chrebalo [76]; *D. sylvestris* (Scopoli, 1763), recorded from Gudauri, Pasanauri, Batumi, Manglisi, Kavtiskhevi, Bakuriani, Nedzvi, Tori, Borjomi, Abastumani [78], Abano, Omalo, Gurshevi, Ketrisi, Koruldashi, Lagilda, Lagodekhi reserve, Lebarde, Kochalos mta, Manglisi, Mestia, Tetrtsklebi, Ushguli, Khashuri, Itria, Tsageri, Tsana, Tskneti, Chrebalo [76]; *Eumenes coarctatus* (Linnaeus, 1758), recorded from Klukhori and Apkhazeti [76]; *E. papillarius* (Christ, 1791), recorded from Apkhazeti [76]; *E. pedunculatus* (Panzer, 1799), recorded from Apkhazeti [76]; *Euodynerus dantici* (Rossi, 1790), recorded from Tbilisi [75]; *E. posticus* (Herrich-Schäffer, 1841), recorded from Lagodekhi [75], Nasakirali mineral waters [76]; *Hemipterochilus bembeciformis* (F. Morawitz, 1867), recorded from Eldari [76]; *Katamenes arbustorum* (Panzer, 1799), recorded from Kojori [76]; *K. flavigularis* (Blüthgen, 1951), recorded from Akhaltsikhe [79]; *Leptochilus mimulus* Gusenleitner, 1970, recorded from Akhaltsikhe [75]; *Microdynerus microdynerus* (Dalla Torre, 1889), recorded from Borjomi [74,80]; *Odynerus melanocephalus* (Gmelin, 1790), recorded from Orbeli [76]; *O. nigrospinosus* (F. Morawitz, 1895), recorded from Apkhazeti [76]; *O. serricrus* (Blüthgen, 1963), recorded from Omalo [76]; *O. spinipes* (Linnaeus, 1758), recorded from Eldari [76]; *Polistes atrimandibularis* S. Zimmermann, 1930, recorded from Lagodekhi reserve, Khashuri, Itria [76]; *P. biglumis* (Linnaeus, 1758), recorded

from Omalo, Lebarde, Tkemlovani, Ushguli, Tsageri [76]; *P. foederatus* Kohl, 1898, recorded from Gardabani, Gurshevi, Lagodekhi reserve, Lebarde, Ksani, Sokhumi, Ushguli, Khashuri, Itria, Tsana, Tskneti [76]; *P. gallicus* Linnaeus, 1761, recorded from Borjomi [20], Akhmeta, Batumi, Gentsvishi, Kvareli, Kojori, Lagodekhi reserve, Nasakirali mineral waters, Near lake Ritsa, Saguramo, Tbilisi, Rustavi, Tskadisi, Utsera (Skodora), Iori valley, Khashuri, Khulo, Tsageri, Dedoplistskaro, Tskneti, Shiraki, Shulaveri [76]; *P. nimpha* (Christ, 1791), recorded from Omalo, Lekistskali, Mestia, Nasakirali mineral waters, Tbilisi, Tskadisi, Khulo [76]; *P. semenowi* F. Morawitz, 1889, recorded from Lagodekhi reserve [76]; *Pseudepipona herrichii* (de Saussure, 1856), recorded from Borjomi, Lagodekhi [76]; Akhaltsikhe [79]; *Pterochelilus phaleratus* (Panzer, 1797), recorded from Kojori [75]; *Stenodynerus bluethgeni* van der Vecht, 1971, recorded from Borshom [75]; *S. fastidiosissimus* (de Saussure, 1855), recorded from Tbilisi [75]; *S. punctifrons* (Thomson, 1874), recorded from Omalo [76]; *S. xanthomelas* (Herrich-Schäffer, 1839), recorded from Borjomi [75]; *Symmorphus bifasciatus* (Linnaeus, 1761), recorded from Eldari [76]; *S. gracilis* (Brullé, 1833), recorded from Borjomi [75], Omalo [76]; *Vespa crabro* Linnaeus, 1758, recorded from Baatumi botanical garden, Kojori, Kutaisi, Sagoria Oak forest, Saguramo, Oni, Poti, Chala (Ozurgeti) [76]; *Vespula germanica* (Fabricius, 1793), recorded from Akhmeta, Borjomi, Ialguja, Kojori, Ozurgeti, Nasakirali mineral waters, Ateni, Bakhvi, Isriti, Kurzu, Menji, Sokhumi, Tbilisi, Khaishi, Khashuri, Iorta, Tskneti [76]; *V. rufa* (Linnaeus, 1758), recorded from Avadkhara, Omalo, Lagodekhi reserve, Tetrtsklebi, Khulo, Tsana [76]; *V. vulgaris* (Linnaeus, 1758), Avadkhara, Akhmeta, Kojori, Lagodekhi reserve, Lebarde, Nasakirali mineral waters, Ritsa, Tbilisi, Klich, Bzvani, Bakhvi, Tetrtsklebi, Khashuri, Itria, Khulo, Iupshara [76].

## Results and Discussion

### *Species inventory, Patters of Diversity and Distribution*

In total we found 54 woody and 244 herbaceous plant species [9]. Our results show, that woody plant species richness decreased with altitude (Tab. 1), while herbs reached highest richness above 2200 m (Tab. 1). Species richness of plants and Hymenoptera were negatively correlated. This pattern was

opposed to previous results on Encyrtidae [9], but similar to that of Chrysomelidae [81].

Following families: Gasteruptionidae, Heloridae and Bethyridae are new to Georgia, therefore all genera and species recorded from these families are new to Georgia too. In total 14 new genera and 57 species are new for Georgia. Prior our study 39 species have been recorded from Lagodekhi reserve, we recorded only 4 species previously recorded from this area and 87 species are new for Lagodekhi protected areas, thus the number of species increased to 126 species.

Our study increased the number of families, and species reported from Georgia. Hymenopteran species richness was not significantly related with plant richness, either with total richness (Tab. 1,  $r = -0.68$ ,  $P > 0.05$ ), nor with herb richness (Tab. 1,  $r = -0.65$ ,  $P > 0.10$ ) or woody plant richness (Tab. 1,  $r = 0.19$ ,  $P > 0.10$ ). These negative results indicate that the hosts of many of the parasitoid and predatory Hymenoptera do not directly depend on plant species richness. In turn, Hymenopteran richness (Tab. 1,  $r = -0.91$ ,  $P < 0.01$ ) and catches (Tab. 1  $r = -0.89$ ,  $P < 0.01$ ), as well as the respective catches/richness relationship (Tab. 2,  $r = -0.88$ ,  $P = 0.01$ ) decreased with increasing altitude contrary to the finding of Mumladze et al. [7](2017) how reported an inverse altitudinal gradient in the hymenopteran family Encyrtidae.

The proportion of Hymenoptera species to that of plants decreased with altitude (Tab. 2,  $r = -0.86$ ,  $P = 0.01$ ). This was mainly due to the respective relation for herbivorous species (Tab. 2,  $r = -0.84$ ,  $P = 0.02$ ).

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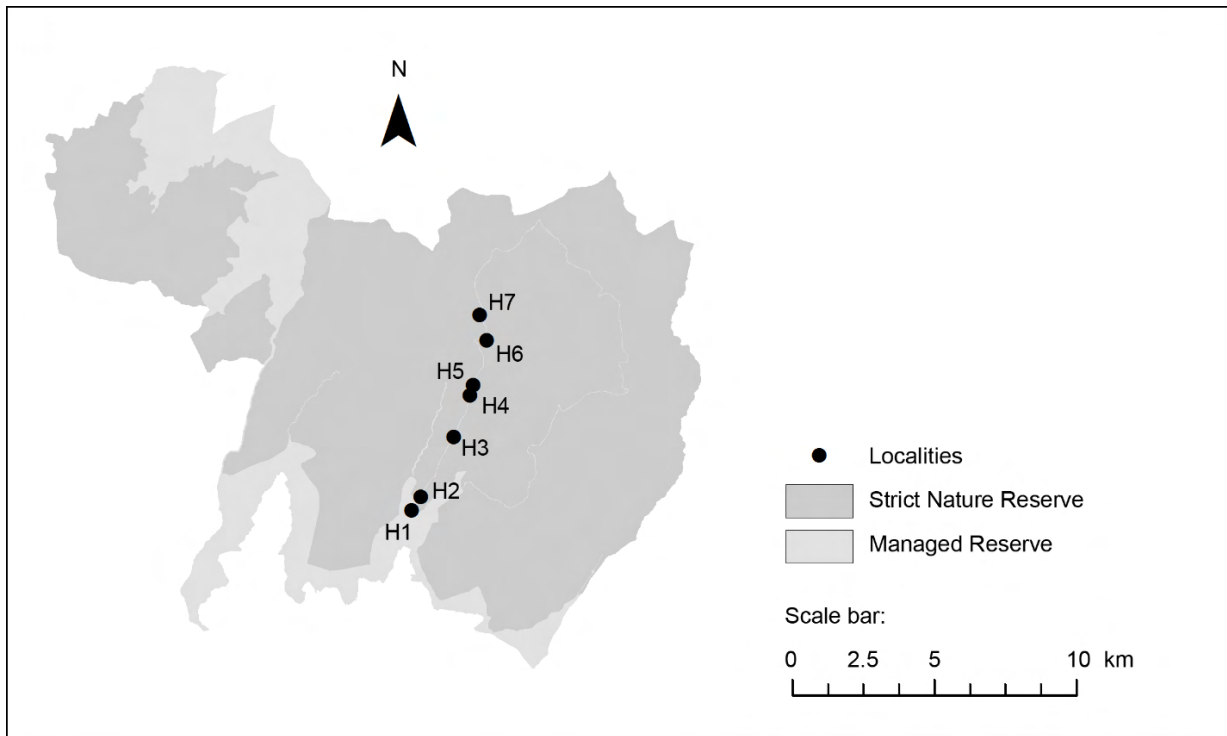
**Figure 1.** Geographic location and the limits of Lagodekhi Protected Areas. Points on the map show the sampling sites from the lowest (H1) to the highest (H7).

**Table 1.** Basic data on sample sites, elevation, hymenopteran catches, and hymenopteran and plant richness. Estimated richness is based on the second order jackknife.

Sam-pling localities	Eleva-tion	Total hymenop-teran catches	Hyme-nopteran species richness	Expected hymenop-teran richness	Unique species at this level	Species caught only once	Species caught twice	Total plant richness	Woody plant richness	Herb richness
H1	665	571	58	76	11	19	10	51	12	39
H2	841	448	46	62	9	13	5	50	14	35
H3	1350	590	53	65	10	17	12	39	10	28
H4	1840	83	26	44	1	12	4	34	10	22
H5	1920	13	6	10	2	4	0	90	17	69
H6	2230	68	21	29	0	9	5	139	7	127
H7	2559	28	10	18	1	4	1	119	3	112

**Table 2.** Basic relationships between plant and hymenopteran richness based on the data in Table 1.

Sampling localities	Hymenoptera catches / richness	Hymenoptera richness / plant richness	Hymenoptera richness / woody plant richness	Hymenoptera richness / herb richness
H1	9.84	1.14	4.83	1.49
H2	9.74	0.92	3.29	1.31
H3	11.13	1.36	5.30	1.89
H4	3.19	0.76	2.60	1.18
H5	2.17	0.07	0.35	0.09
H6	3.24	0.15	3.00	0.17
H7	2.80	0.08	3.33	0.09



**Fig.** *Areas of study in Lagodekhi Protected Areas*

Points on the map show the sampling sites from lowest (H1) to the highest (H7).

H1 – mountain low zone; H2, H3 – mountain middle zone; H4, H5 – mountain upper zone;  
H6 – subalpine zone; H7 – alpine zone.