CHECK-LIST OF GASTERUPTIID WASPS (HYMENOPTERA: GASTERUPTIIDAE) OF LITHUANIA, WITH NEW DATA ON TROPHIC INTERACTIONS

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Introduction

Gasteruptiidae (Hymenoptera: Evanioidea) is a family of apocritan wasps containing 9 genera and 500 described species worldwide with the biggest species richness in tropical areas (Crosskey, 1962; Goulet & Huber, 1993; Jennings & Austin, 2004). Gasteruptiids are characterized by elongate body, long and neck-like propleura, highly attached slender metasoma, and strongly clavate metatibia (Goulet & Huber, 1993; Jennings & Austin, 2004). They develop in nests of solitary bees and wasps (Hymenoptera: Apoidea, Vespoidea) feeding on their eggs, larvae, and/or provisions (Crosskey, 1962; Goulet & Huber, 1993; Jennings & Austin, 2004; Bogusch *et al*., 2018). The food resource of imagoes is nectar or both nectar and pollen mainly from flowers of the families Apiaceae and Myrtaceae (Jennings & Austin, 2004).

All gasteruptiid wasps of the Palaearctic region belong to the genus *Gasteruption* Latreille, 1796 (van Achterberg & Talebi, 2014). This genus comprises about 400 described species worldwide (Jennings & Austin, 2002), while 30 species of them are found in Europe (Madl, 2013; van Achterberg & Talebi, 2014). Unfortunately, no comprehensive reviews on the gasteruptiid distribution in Lithuania and the adjacent countries have been carried out so far. It is only known that 9 Gasteruptiidae species are recorded in Poland (Madl, 2013; Wiśniowski, 2016), what means that similar number of species can be expected in Lithuania as well.

The aim of this publication is to present a faunistic check-list of gasteruptiid wasps and their trophic interactions on the territory of Lithuania.

Material and Methods

The material was collected during field research in 22 administrative districts of Lithuania by E. Čiplys (abbreviated as E.Č.), B. Gliwa (B.G.), D. Kalytytė (D.K.), A. Košel (A.K.), Łossowska (Ł.), V. Makarevič (V.M.), Ž. Nevronytė (Ž.N.), Orlova (O.), A. Raudoniūtė (A.R.), Skrupskelytė (S.), A. Stirbytė (A.S.), J. Turčinavičienė (J.T.), and, if not stated otherwise, by E. Budrys. For several specimens, the collector was unknown (-). Some gasteruptiids were caught by an entomological net, while the majority of them collected by E. Budrys, A. Košel, Ž. Nevronytė, A. Raudoniūtė, J. Turčinavičienė were reared from trap-nests of cavity-nesting Hymenoptera (Budrienė, 2003; Budrys *et al*., 2010). This method allowed obtaining data not only of species composition, but also of trophic interactions between trap-nesting species and their natural enemies, in this case – gasteruptiid wasps.

The Gasteruptiidae species were identified by the authors using the keys of C. van

Achterberg, A. A. Talebi (2014) and N. Johansson, C. van Achterberg (2016). The material is deposited in the collections of the Nature Research Centre (Vilnius, Lithuania) and the Museum of Zoology of Vilnius University (Vilnius, Lithuania).

The species recorded in Lithuania for the first time are marked with an asterisk (*).

List of localities

Locality	Administrative district	Coordinates (LAT, LONG)
Adutiškis env.	Švenčionys distr.	55.1243, 26.4630
Ariogala, 3 km NW	Raseiniai distr.	55.27833, 23.45538
Arliškės	Vilnius distr.	54.97250, 25.35083
Armoniškiai	Marijampolė distr.	54.43667, 23.36472
Bargavonės Miškas f.	Joniškis distr.	56.11611, 23.60639
Bilšiai	Molėtai distr.	55.13361, 25.27111
Būdviečiai	Vilkaviškis distr.	54.54583, 22.90194
Dargužiai (3)	Varėna distr.	54.39194, 24.82389
Dargužiai (4)	Varėna distr.	54.39583, 25.82167
Dargužiai (5)	Varėna distr.	54.39639, 24.85806
Dūdai	Širvintos distr.	55.09556, 24.75694
Dūkštų Ąžuolai f.	Vilnius distr.	54.83944, 24.96472
Einorų Miškas f. (4)	Alytus distr.	54.30611, 24.09806
Einorų Miškas f. (7)	Alytus distr.	54.29806, 24.09750
Gintviliškis	Anykščiai distr.	55.44833, 25.28167
Išdagai	Jurbarkas distr.	55.06500, 22.41667
Kalniškės Miškas f.	Lazdijai distr.	54.32333, 23.56972
Kartuvėlė	Molėtai distr.	55.09889, 25.35750
Katiliai	Šakiai distr.	54.86667, 23.12139
Kaunas	Kaunas mun.	54.90417, 23.90389
Kazokų Miškas f. (3)	Molėtai distr.	55.13833, 25.37667
Kazokų Miškas f. (4)	Molėtai distr.	55.13833, 25.37556
Kazokų Miškas f. (5)	Molėtai distr.	55.13750, 25.38611
Kazokų Miškas f. (7)	Molėtai distr.	55.13194, 25.38750
Kazokų Miškas f. (8)	Molėtai distr.	55.13889, 25.38444
Kiemelių Miškelis f.	Vilnius distr.	54.85222, 25.00472
Klusiškių Miškas f. (11)	Pakruojis distr.	56.06667, 23.72194
Klusiškių Miškas f. (14)	Pakruojis distr.	56.06722, 23.72056
Labanoro Giria f.	Švenčionys distr.	55.13444, 25.77528
Lakštučiai	Vilkaviškis distr.	54.58444, 23.04278
Marcinkonys	Varėna distr.	54.05969, 24.39430
Marijampolė env.	Marijampolė distr.	54.5754, 23.3696
Naujieji Verkiai	Vilnius mun.	54.75389, 25.31889
Naujienos	Trakai distr.	54.41444, 24.83722
Nida	Neringa mun.	55.31076, 21.00787
Papiškiai	Pasvalys distr.	55.93306, 24.27639
Pavilnys	Vilnius mun.	54.67639, 25.37056
Pogarendos Miškas f.	Varėna distr.	53.91972, 24.45972
Pravieniškių Miškas f.	Kaišiadorys distr.	54.92000, 24.27139

Puvočiai	Varėna distr.	54.11624, 24.30497
Puvočių Miškas f.	Varėna distr.	54.11861, 24.32806
Račiškių Miškelis f.	Molėtai distr.	55.13500, 25.27056
Rudžių Miškelis f.	Marijampolė distr.	54.59083, 23.27917
Rusėnai	Vilnius distr.	54.83000, 24.95972
Rūdiškių Miškas f. (5)	Trakai distr.	54.47083, 24.95139
Rūdiškių Miškas f. (8)	Trakai distr.	54.47111, 24.95528
Sargeliai	Raseiniai distr.	55.47806, 23.45722
Skiemonys, 4 km SE	Anykščiai distr.	55.40259, 25.31747
Smailiai	Molėtai distr.	55.08250, 25.35083
Stakai	Šalčininkai distr.	54.28111, 25.54778
Šunskų Miškas f.	Marijampolė distr.	54.62833, 23.35917
Šventoji	Palanga mun.	56.02139, 21.07944
Trakai	Trakai distr.	54.63111, 24.93556
Trakai distr.	Trakai distr.	54.66, 24.93
Trakelio Miškas f.	Alytus distr.	54.41972, 23.72722
Uosijos Miškas f.	Vilkaviškis distr.	54.62861, 22.99500
Ūdininkai	Lazdijai distr.	54.21917, 23.40361
Valavičių Miškas f.	Marijampolė distr.	54.50778, 23.18278
Varnionių Miškas f. (3)	Radviliškis distr.	55.71528, 23.52917
Varnionių Miškas f. (4)	Radviliškis distr.	55.73167, 23.52778
Varnionių Miškas f. (7)	Radviliškis distr.	55.71889, 23.50583
Verkiai	Vilnius mun.	54.75139, 25.31222
Vicentiškiai	Kalvarija mun.	54.39139, 23.31278
Vilkaraisčiai	Molėtai distr.	55.13778, 25.35722
Vilkiaušių Miškas f.	Joniškis distr.	56.17889, 23.54333
Žaizdriai	Trakai distr.	54.62278, 24.89806
Želtiškių Miškas f. (1)	Anykščiai distr.	55.39556, 25.26861
Želtiškių Miškas f. (5)	Anykščiai distr.	55.39417, 25.27194
Želtiškių Miškas f. (13)	Anykščiai distr.	55.39556, 25.26694
Želtiškių Miškas f. (14)	Anykščiai distr.	55.39694, 25.26472
Želtiškių Miškas f. (15)	Anykščiai distr.	55.39639, 25.26556
Želtiškių Miškas f. (16)	Anykščiai distr.	55.39806, 25.26611
Žemaitkiemis	Lazdijai distr.	54.24861, 23.44861

List of species

GASTERUPTIIDAE

***Gasteruption assectator* (Linnaeus, 1758)**

Material studied: Ariogala, 3 km NW, 12 06 1992, 1 ♀ 1 ♂; Einorų Miškas f. (4), 31 05–12 09 2014, 1 ♀; Kaunas, 01 08 2017, 1 ♀; Trakelio Miškas f., 02 06–28 08 2009, 1 ♀ 1 ♂.

Host: *Hylaeus communis* Nylander, 1852 (Colletidae).

***Gasteruption boreale* (Thomson, 1883)**

Material studied: Bilšiai, 17 06 2017, 1 ♂; Dargužiai (3), 20 06–05 09 2013, 4 ♀ 1 ♂; Dargužiai (4), 20 06–05 09 2013, 2 ♀ 2 ♂; Kaunas, 01 06–14 08 2008, 1 ♀; Kiemelių

Miškelis f., 16 05–23 08 2009, 1 ♂; Lakštučiai, 07 06–13 09 2013, 3 ♀; Marijampolė env., 12 07 1927, 1 ♀ (-); Naujieji Verkiai, 21 05–15 09 2009, 1 ♀ 1 ♂ (A. K.); Naujienos, 20 06–05 09 2013, 2 ♀ 1 ♂; Pavilnys, 15 08 2017, 1 ♀; Uosijos Miškas f., 07 06–13 09 2013, 1 ♀; Ūdininkai, 12 06–17 10 2015, 1 ♀; Verkiai, 05 07 2014, 1 ♂.
Host: *Hylaeus communis* (Colletidae).

***Gasteruption caucasicum* (Guérin-Méneville, 1844)**

Material studied: Adutiškis env., 15 08 1928, 1 ♀ (-); Bilšiai, 27 07 2014, 1 ♀, 28 06 2015, 1 ♂, 17 07 2016, 1 ♂.
Hosts: Unknown.

***Gasteruption insidiosum* Semenov, 1892**

Material studied: Bilšiai, 19 06–04 09 2016, 1 ♀; Varnionių Miškas f. (7), 29 05–10 10 2015, 3 ♀ 1 ♂; Žaizdriai, 18 06–02 09 2017, 1 ♀ (A.R.).
Host: *Chelostoma rapunculi* (Lepeletier, 1841) (Megachilidae).

***Gasteruption jaculator* (Linnaeus, 1758)**

Material studied: Arliškės, 31 05–21 09 2008, 1 ♀; Armoniškiai, 02 06–28 08 2009, 1 ♀; Bargavonės Miškas f., 23 05–20 09 2013, 1 ♀; Bilšiai, 19 05–25 08 2007, 1 ♀, 30 07 2017, 1 ♀; Būdviečiai, 25 06–02 10 2011, 1 ♀; Dargužiai (4), 20 06–05 09 2013, 1 ♀; Dargužiai (5), 20 06–05 09 2013, 1 ♀; Dūdai, 06 06–20 09 2009, 1 ♂ (J. T.); Dūkštų Ąžuolai f., 12 06–12 09 2010, 2 ♀ 1 ♂ (A.K.), 05 06–11 09 2011, 1 ♀ 2 ♂ (A.K.); Einorų Miškas f. (7), 31 05–12 09 2014, 1 ♀; Gintviliškis, 10 05–29 08 2009, 3 ♀; Išdagai, 31 05–25 08 2004, 1 ♀; Kalniškės Miškas f., 18 06–21 09 2012, 1 ♂; Kartuvėlė, 06 06–25 09 2009, 1 ♀ 1 ♂; Katiliai, 30 05–27 09 2013, 1 ♀ 1 ♂; Kaunas, 01 06–14 08 2008, 2 ♀, 05 06–09 09 2010, 3 ♀, 16 07 2010, 1 ♀, 07 08 2010, 1 ♀, 29 05–12 09 2013, 1 ♀, 24 06 2016, 2 ♀; Kazokų Miškas f. (3), 09 06–24 10 2015, 2 ♂; Kazokų Miškas f. (4), 09 06–24 10 2015, 3 ♀ 1 ♂; Kazokų Miškas f. (5), 09 06–24 10 2015, 1 ♀; Kazokų Miškas f. (7), 09 06–24 10 2015, 1 ♀ 1 ♂; Kazokų Miškas f. (8), 09 06–24 10 2015, 1 ♀ 1 ♂; Klusiškių Miškas f. (11), 11 06–10 10 2015, 3 ♀; Klusiškių Miškas f. (14), 11 06–10 10 2015, 2 ♀; Labanoro Giria f., 06 06–24 10 2015, 1 ♀; Marijampolė env., 21 07 1927, 1 ♀ (-), 29 07 1927, 1 ♀ (-); Naujieji Verkiai, 21 05–15 09 2009, 1 ♀ (A.K.); Naujienos, 20 06–05 09 2013, 1 ♀; Nida, 06 08 1990, 1 ♀ (O.); Papiškiai, 04 07–30 08 2007, 2 ♀ (Ž.N.), 07 06–16 08 2008, 1 ♂ (Ž.N.); Pogarendos Miškas f., 21 05–20 08 2007, 1 ♀; Pravieniškių Miškas f., 04 06–14 10 2015, 1 ♀ 2 ♂; Puvočiai, 18 07 1985, 1 ♀ (A.S.), 15 07 1993, 1 ♀ (S.); Puvočių Miškas f., 18 05–14 09 2014, 2 ♀; Račiškių Miškelis f., 10 05–30 08 2009, 1 ♀; Rudžių Miškelis f., 07 06–13 09 2013, 1 ♀; Rusėnai, 13 05–31 08 2007, 1 ♀; Rūdiškių Miškas f. (5), 14 05–20 09 2014, 2 ♀; Rūdiškių Miškas f. (8), 14 05–20 09 2014, 1 ♀; Sargeliai, 20 06–30 11 2012, 1 ♂ (B.G.); Skiemonys, 4 km SE, 20 06 1992, 1 ♀; Smailiai, 24 05–21 09 2008, 1 ♀; Šunskų Miškas f., 07 06–04 09 2014, 1 ♀; Šventoji, 07–08 08 2015, 2 ♀; Trakai, 14 05–18 09 2016, 1 ♀ (A.R.); Ūdininkai, 27 05–06 08 2014, 2 ♀ 1 ♂, 12 06–17 10 2015, 1 ♀; Valavičių Miškas f., 07 06–13 09 2013, 5 ♀; Varnionių Miškas f. (3), 29 05–10 10 2015, 1 ♂; Varnionių Miškas f. (4), 29 05–10 10 2015, 1 ♀; Vicentiškiai, 05 06–09 09 2010, 3 ♀; Vilkaraisčiai, 07 06–21 09 2008, 1 ♀, 31 05–26 09 2009, 1 ♀; Vilkiaušių Miškas f., 23 05–21 09 2013, 3 ♀; Želtiškių Miškas f. (1), 21 05–23 08 2014, 3 ♀; Želtiškių Miškas f. (5), 22 05–23 09 2011, 1 ♀; Želtiškių Miškas f. (13), 21 05–23 08 2014, 2 ♀ 1 ♂; Želtiškių Miškas f. (14), 21 05–23 08 2014, 2 ♂; Želtiškių Miškas f. (15), 21 05–23 08 2014, 1 ♂; Želtiškių Miškas f. (16), 21 05–23 08 2014, 3 ♀ 2 ♂; Žemaitkiemis, 05 06–09 09

2010, 1 ♀.

Hosts: *Hylaeus communis*, *H. difformis* (Eversmann, 1852), *H. miyakei* Matsumura, 1911 (Colletidae).

***Gasteruption nigritarse* (Thomson, 1883)**

Material studied: Bilšiai, 25 06 2016, 3 ♀ 1 ♂; Kaunas, 01 06–14 08 2008, 1 ♀, 16 07 2010, 3 ♂, 17 06–09 09 2012, 1 ♀ 1 ♂, 24 06 2016, 1 ♂, 01 08 2017, 1 ♂, 12 08 2017, 1 ♀; Marcinkonys, 20 07 2002, 1 ♀ (E.Č.); Marijampolė env., 28 07 1927, 1 ♀ (-); Papiškiai, 04 07–30 08 2007, 2 ♀ 1 ♂ (Ž.N.); Puvočiai, 07 07 1997, 1 ♀ (D. K.), 05 07 2002, 1 ♂ (V.M.); Stakai, 21 05–12 08 2005, 1 ♀; Trakai distr., 28 07 1928, 1 ♀ (Ł.); Ūdininkai, 04 07 2013, 1 ♀, 27 05 2014, 1 ♀, 13 06 2015, 2 ♀ 1 ♂; Vilkaraisčiai, 31 05–26 09 2009, 3 ♀ 3 ♂.

Hosts: *Hylaeus communis*, *H. difformis* (Colletidae).

Discussion

This study presents faunistic data on the 6 species of gasteruptiid wasps (Hymenoptera: Gasteruptiidae) collected in the territory of Lithuania for the first time and their trophic interactions.

According to the results, *Gasteruption jaculator* appeared to be the most abundant species of gasteruptiids in Lithuania. It is widely distributed in the Palaearctic region (Yildirim *et al*., 2004; van Achterberg & Talebi, 2014). This species can be identified by wide, lamelliform occipital carina (Fig.1 A) and long ovipositor sheath with white or ivory apex (van Achterberg & Talebi, 2014). The reared material of *G. jaculator* from *Hylaeus communis*, *H. difformis*, and *H. miyakei* nests supports the published host data consisting of *Pemphredon* Latreille, 1796 (Crabronidae), *Odynerus* Latreille, 1802 (Vespidae), *Colletes* Latreille, 1802, *Hylaeus* Fabricius, 1793, and *Osmia* Panzer, 1806 (Apidae) genera (Hedqvist, 1973; van Achterberg & Talebi, 2014).

Gasteruption insidiosum, found in Eastern Europe, Iran, Turkey, is characterized by wide, thick occipital carina (Fig.1 B) and dark brown, long ovipositor sheath (van Achterberg & Talebi, 2014). We present the first record of the host of *G. insidiosum*, *Chelostoma rapunculi* (Lepeletier, 1841) (Apidae), as no other notes about trophic interactions of this gasteruptiid wasp have been published so far.

The European and Caucasian species, *Gasteruption caucasicum*, can be recognized by a deep medial depression on vertex in front of occipital carina (Fig.1 C) and wide, lamelliform antesternal carina (van Achterberg & Talebi, 2014). According to the earlier studies (van Achterberg & Talebi, 2014), it develops in *Colletes* and *Hylaeus* (Apidae) nests. Unfortunately, it is impossible to confirm or deny this information, because specimens of *G. caucasicum*, sampled in Lithuania, have not been detected in the trap-nests. This gasteruptiid species is included in the red list of Finland as vulnerable (cat. VU) (Laji.fi, 2018). However, due to the insufficient data, the evaluation of the conservation status of this and other gasteruptiid species present in Lithuania is impossible yet.

Fig.1. Occipital carina, lateral view: *Gasteruption jaculator* (A), *G. insidiosum* (B), *G. caucasicum* (C) (photos E. Budrys).

Fig.2. Ovipositor, lateral view: *Gasteruption assectator* (A), *G. boreale* (B), *G. nigritarse* (C) (photos E. Budrys).

Gasteruption assectator is widespread in the Palaearctic. It can be identified by narrow hypostomal bridge, rugose and shiny mesoscutum, short ovipositor sheath without conspicuous bristles (Fig.2 A). Rearing of *G. assectator* from *Hylaeus communis* nests coincides with earlier expectations that this species probably chooses the hosts of the genus *Hylaeus* (Apidae) (Johansson & van Achterberg, 2016).

Gasteruption boreale, recorded in Northern Europe (Johansson & van Achterberg, 2016), Russia, China (Tan *et al*., 2016), differs from other Lithuanian gasteruptiids by narrow hypostomal bridge, smooth with satin sheen mesoscutum, and short ovipositor sheath with scarse straight bristles (Fig.2 B) (Johansson & van Achterberg, 2016). Our detection of *G. boreale* in *Hylaeus communis* nests confirms the presumption made by N. Johansson and C. van Achterberg (2016) that the most probably hosts of *G. boreale* are species of the genus *Hylaeus*.

Gasteruption nigritarse, distributed in Europe, has wide hypostomal bridge, thick and golden facial pubescence, short ovipositor sheath with hooked bristles (Fig.2 C). The new record of *G. nigritarse* in *Hylaeus difformis* nest complements the host list consisted of *H. di□ormis* and *H. pictipes* Nylander, 1852 (Johansson & van Achterberg, 2016).

The records of other Gasteruptiidae species in the north and central European countries (Madl, 2013) show a high probability to enrich the present Lithuanian check-list of this family and along with that, to expand the knowledge on their trophic interactions. Therefore, this publication could be a reasonable starting point for further studies of the distribution of the gasteruptiids in Lithuania and their hosts.

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Lietuvos bitvyčių (Hymenoptera: Gasteruptiidae) rūšių sąrašas ir mitybiniai ryšiai

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Santrauka

Straipsnyje pirmą kartą pristatomas Lietuvoje iki šiol netirtos bitvyčių (Gasteruptiidae) šeimos (Hymenoptera: Evanioidea) rūšių sąrašas bei nauji duomenys apie mitybines sąveikas tarp jų ir lizdavietėse-gaudyklėse lizdus įrengiančių plėviasparnių. Kiekvienai šių vapsvų rūšiai pateikiamos sugavimo vietos ir datos, individų skaičius bei jų lytys, rinkikai ir, jei buvo nustatyta, šeimininkas (-ai). Viena iš aptiktų rūšių, kaukazinis bitvytis *Gasteruption caucasicum* (Guérin-Méneville, 1844), yra įtraukta į raudonąjį Suomijos sąrašą.

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