



## Taxonomy and Systematics/Taxonomia e Sistemática

# *Bracon zuleideae* Periotto & Lara (Hymenoptera, Braconidae): seed predation potential, expansion of the geographic distribution and new data on host plant phenology

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**Abstract.** Here, by the first time, was quantified the predation of seeds of *Protium ovatum* Engl. (Burseraceae) by *Bracon zuleideae* Periotto & Lara (Hymenoptera, Braconidae), a phytophagous seed eater, at Parque Nacional Grande Sertão Veredas, located in the State of Minas Gerais, Brazil. *B. zuleideae* is now mentioned for the state of Minas Gerais, Brazil, which extends its geographical distribution about 900 km north of its type locality, its only previous record, and new data about host plant phenology are provided.

**Keywords.** Braconidae phytophagy; Braconinae; Brazilian savannah; Neotropical Region; seed predation.

### *Bracon zuleideae* Periotto & Lara (Hymenoptera, Braconidae): potencial de predação de sementes, expansão da distribuição geográfica e novos dados de fenologia da planta hospedeira

**Resumo.** A predação de sementes de *Protium ovatum* Engl. (Burseraceae) por *Bracon zuleideae* Periotto & Lara (Hymenoptera, Braconidae) foi quantificada pela primeira vez no Parque Nacional Grande Sertão Veredas, em Minas Gerais, Brasil. A distribuição geográfica de *B. zuleideae* é estendida para o Estado de Minas Gerais, Brasil, a cerca de 900 km ao norte da localidade tipo, o único registro anterior, e novos dados sobre a fenologia da planta hospedeira são fornecidos.

**Palavras-Chave:** Braconinae; cerrado; fitofagia em Braconidae; predação de sementes; Região Neotropical.

**B**raconidae is the second most diverse family of Hymenoptera and includes about 19,500 species distributed by nearly 1,000 genera in 46 subfamilies and the estimated species richness in the world varies between 40-100 thousand species (WHARTON 1993; CAMPOS & SHARKEY 2006; SHAW 2006; YU *et al.* 2011). The vast majority of Braconidae act as parasitoids of other insects, especially holometabolous in egg-larva phase or larva and the parasitism of adults or nymphs of hemimetabolous insects occurs only in Aphidiinae and Euphorinae (CAMPOS & SHARKEY 2006).

The first report of a braconid with phytophagous immature stages was made by MACÊDO & MONTEIRO (1989). MARSH (1991) described *Allorhogas dyspistus* (Doryctinae), which causes galls in Fabaceae. MARSH (2002) reported *Allorhogas argentinus* Marsh, 2002 and *Allorhogas hansonii* Marsh forming galls in seeds of *Abarema macradenia* (Pittier) Barnaby & Grimes (Fabaceae) and associated with *Inga vera* Wild (Fabaceae) fruits,

respectively. In Doryctinae, phytophagy was also reported in *Monitoriella* Hedqvist (INFANTE *et al.* 1995) and probably occurs in *Labania* Hedqvist (WHARTON & HANSON 2005), *Mononeuron* Fischer (CHAVARRÍA *et al.* 2009), and *Psenobolus* Reinhard (RAMÍREZ & MARSH 1996).

Braconinae is one of the largest subfamilies of Braconidae with more than 200 genera and about 2,5 thousand species (SHAW & HUDDLESON 1991; QUICKE 2015) that, in their vast majority, act as larval ectoparasitoids of Coleoptera, Lepidoptera, Diptera and Hymenoptera (SHAW & HUDDLESON 1991; QUICKE 1997). This subfamily is dominated by the cosmopolitan and very common type genus *Bracon* Fabricius, 1804 composed by about 1,000 species described worldwide (BELSHAW *et al.* 2001; LONI *et al.* 2016) which acts mainly as parasitoids of a wide range of lepidopterous, coleopterous and dipterous larvae (CAMPOS & SHARKEY 2006). However, among the *Bracon* species, three stand out because of their unusual food habit in association

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with plants of the family Burseraceae: the neotropical species *B. phytophagous* Quicke and *Bracon zuleideae* Perioto & Lara act as seed predators in plants of *Protium tovarense* Pittier and *P. ovatum* Engl. in Mart., respectively, and the oriental *B. garugaphagae* Ranjith & Quicke that act as entomophytophagous species (i.e. ones that display entomophagy and phytophagy sequentially) in leaf galls induced by the psyllid *Phacopteron lentiginosum* Buckton (Hemiptera: Psylloidea) on *Garuga pinnata* Roxb. (FLORES et al. 2005; PERIOTO et al. 2011; RANJITH et al. 2016).

*Protium ovatum* is a native and endemic species from the Brazilian savannah and Amazon areas (REFLORA 2019) popularly known as “breu-do-cerrado”, “breu-arbustivo” and “almacega” is easily recognized in the field by the fact that its leaves, when crushed, exude a strong mango scent. *P. ovatum* is a shrub of 0.4-4.0 m high, with glabrous branches and few lenticels. Its leaves are oval, glabrous, composed, with 3-5 coriaceous leaflets; the species blooms from April to September when fruits can be observed (LIMA & PIRANI 2005) and is explored by agro-extractivists and its essential oils are used in the production of medicines and incenses (SOUZA 2016). *P. ovatum* seems to have promising potential for economic use since, in the literature, there are reports that *Protium* resins are widely used in traditional medicine for wound healing, with analgesic and antiseptic properties, as well as in the production of perfumes and cosmetics, among other uses (RÜDIGER et al. 2007); in biological assays these resins showed potent anti-inflammatory activity (SIANI et al. 1999; ALMEIDA et al. 2015) in addition to having compounds that can be used to treat liver disease (OLIVEIRA et al. 2005).

The objective of this study was to evaluate the potential of predation of seeds of *P. ovatum* by the braconid wasp *B.*

*zuleideae*, extend its geographic distribution and provide new data on host plant phenology.

## MATERIAL AND METHODS

The studied specimens of *B. zuleideae* were obtained from fruits of *P. ovatum* (Figure 1) collected at random along a trail of about 350 m in length in area of Brazilian savannah vegetation (Cerrado *strictu sensu*) within the Parque Nacional Grande Sertão Veredas (15°10'31.7" S/45°43'14.9" W), located in the municipality of Chapada Gaúcha, Minas Gerais State, Brazil, in September 12, 2018.

A total of 153 almost ripe fruits were collected from about 30 plants. The fruits were maintained in plastic containers (10 cm diameter, 15 cm high) covered with synthetic gauze and sent to the Laboratório de Sistemática e Bioecologia de Predadores e Parasitoides of the Instituto Biológico, in Ribeirão Preto, São Paulo, Brazil.

In the laboratory the fruits were individualized in glass vials (2.4 cm diameter, 8.3 cm high) covered with plastic film and kept at ambient temperature and humidity and observed daily until the adult wasps emerged. The emerged insects were kept in a 15 mL plastic vial with 95% ethanol and later air dried, mounted on entomological pins and labeled. Thirty-six days after collection, fruits that did not display adult exit holes of *P. ovatum* were dissected to check the contents of their interior.

The specific identification of the studied specimens was made by the first author.

Images were taken using a digital camera Leica MC170 HD attached to a stereomicroscope Leica M205CAPO and specimens illuminated with high diffuse dome illumination Leica LED5000 HDI. Focus stacking of images was done using Helicon Focus



Figure 1. Branch with fruits of *Protium ovatum* Engl. (Burseraceae).

(version 5.3). The figures were prepared using Adobe Photoshop (version 11.0).

The voucher specimens examined in this study have been deposited in the Coleção Entomológica do Laboratório de Sistemática e Bioecologia de Predadores e Parasitoides of the Instituto Biológico (LRRP), Ribeirão Preto, SP, Brazil, N.W. Perioto, curator. The collections were done under a Brazilian Biodiversity Information and Authorization System (SISBIO) license# 16473-1.

## RESULTS AND DISCUSSION

### Studied material

#### *Bracon zuleideae* Perioto & Lara, 2011

(Figure 2)

Brasil, MG, Chapada Gaúcha, Parque Nacional Grande Sertão Veredas (15°10'31.7" S/45°43'14.9" W), Cerrado, ex. frutos de *P. ovatum*, 12/IX/2018, NW Perioto e equipe, cols.; LRRP# 17031-17060, 17♀, 13♂ (LRRP).

The phenological behavior of the approximately 12,000 plant species that develop in the Cerrado is fragmented (MENDONÇA *et al.* 2008; OLIVEIRA 2008), since only a very small fraction of this flora had such behavior studied. Knowledge of the phenology is fundamental to understand the plant community structure, function, and the quality and quantity of resources available for consumers organisms (WILLIAMS *et al.* 1999). The knowledge about the phenology of *P. ovatum* is inserted in this context: for the state of São Paulo, it is known that this plant is collected with flowers from April to September and with fruits in September

(LIMA & PIRANI 2005). The fruits used in this study were collected almost ripe in September and, in the collection area, many of them were still at the beginning of development, indicating that the fruiting season of this widely distributed plant would extend even longer; such facts may indicate the existence of latitude-dependent variations in the fruiting season.

*Bracon zuleideae* is the second obligately known phytophagous species of Braconinae and, except for the fact that only one larva was ever observed feeding within each seed of *P. ovatum*, nothing more is known about its biology. This behavior was also observed by FLORES *et al.* (2005) for *B. phytophagous*, the first obligately known phytophagous species of Braconinae, in seeds of *P. tovarense*.

In this study were obtained 153 fruits and 190 seeds since each fruit of *P. ovatum* can harbor more than one seed. From the fruits emerged 30 adults of *B. zuleideae* (17♀, 13♂) and, within the dissected seeds were found the remains of ten larvae of that wasp, totaling 40 seeds predated, which resulted in a percentage fruit infestation of 21.1%. This value is lower than that found by FLORES *et al.* (2005) (50-60%) for *B. phytophagous* in fruits of *P. tovarense*; however, it should be noted that the study of FLORES *et al.* (*opus cit.*) lasted ten months.

In this study, the geographical distribution of *B. zuleideae* is extended by about 900 km north from the type locality and the species is now mentioned for the Minas Gerais State (Figure 3). *P. ovatum* is a plant widely distributed over vast areas of the Cerrado and Amazon biomes (REFLORA 2019) and this fact allows us to infer that the geographical distribution of *B. zuleideae* can be much wider than currently known.



Figure 2. *Bracon zuleideae* Perioto & Lara, 2011 (Hymenoptera, Braconidae), habitus lateral of female and male.

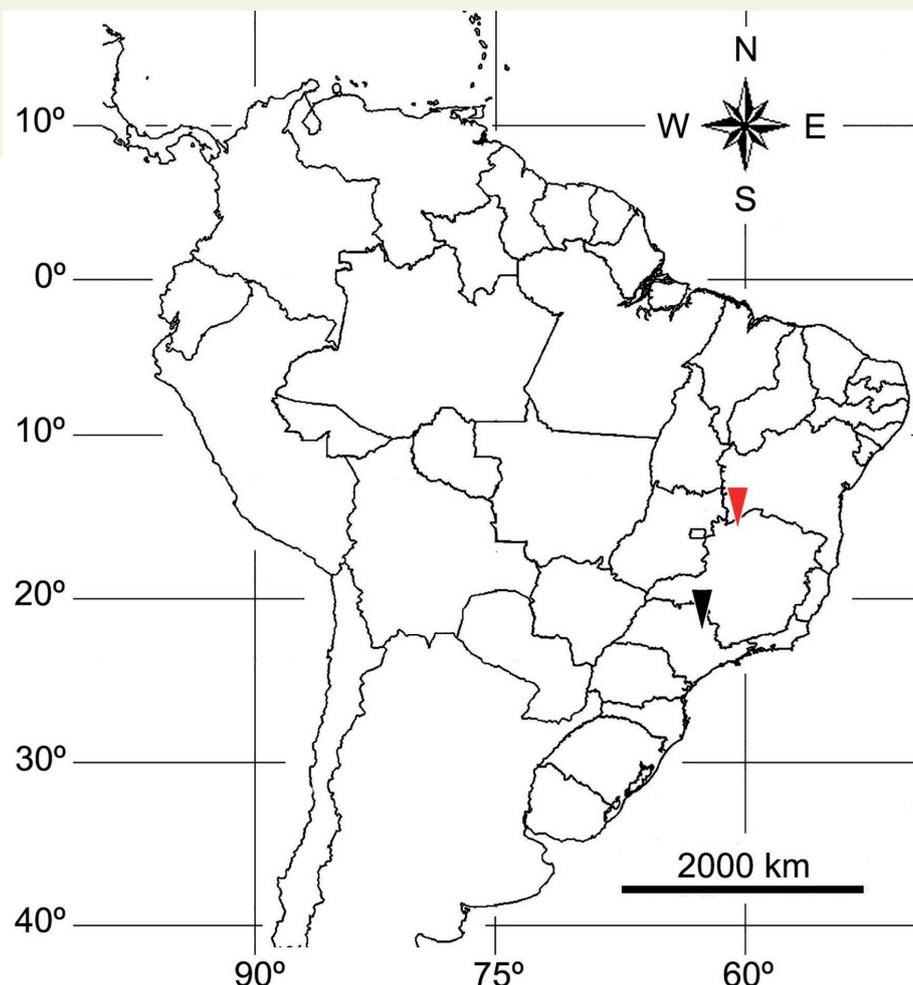


Figure 3. Map of known distribution of *Bracon zuleideae* Perioto & Lara, 2011 (Hymenoptera, Braconidae). Black triangle indicate the type locality and the red one the new record.

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