

**New record of Ichneumonidae parasitizing the brood of
Trypoxylon nitidum Smith, 1856 (Hymenoptera: Crabronidae)**
Novo registro de Ichneumonidae parasitando a prole de
Trypoxylon nitidum Smith, 1856 (Hymenoptera: Crabronidae)

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Abstract: We have recorded, for the first time, the ichneumonid *Photocryptus concinnus* (Brullé) parasitizing the brood of the solitary wasp *Trypoxylon (Trypargilum) nitidum* Smith in a reused nest (Aculeata) in the state of Pará, Amazonia, Brazil.

Keywords: Parasitoid wasp. Interaction. Host. Neotropical.

Resumo: Registramos, pela primeira vez, o icneumonídeo *Photocryptus concinnus* (Brullé, 1846) parasitando a prole da vespa solitária *Trypoxylon (Trypargilum) nitidum* Smith, 1856 em ninho reutilizado (Aculeata) no estado do Pará, Amazônia, Brasil.

Palavras-chave: Vespa parasitoide. Interação. Hospedeiro. Neotropical.

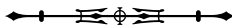
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INTRODUCTION

The nest built by aculeate wasps provide ideal conditions for the proliferation of other species, including associated guilds, predator and parasitoids. Specifically abandoned wasp nests, depending on their location, can remain in good conservation status after abandonment, allowing them to be reused by generations that succeed the original builders or solitary females of other Hymenoptera taxa. Reuse can occur in both active or abandoned nest cells (Pinto, 2005).

Trypoxylon Latreille, 1796 is the largest genus of Crabronidae *sensu stricto* (Crabroninae: Trypoxylini), with 633 described living species distributed across all biogeographical regions. The subgenus *Trypoxylon* (*Trypargilum*) Richards, 1934 is restricted to the New World and has greater diversity in the Neotropics (Amarante, 2002, 2005; Pulawski, 2023). Currently, *T.* (*Trypargilum*) comprises 94 species, 49 of which occur in Brazil. These wasps utilize clay to build their nests, which can be construct in pre-existing cavities or reused nests (Peruquetti & Lama, 2003). The cells are provisioned with paralyzed spiders that serve as food for the larvae. *T.* (*Trypargilum*) species show solitary behavior, with males engaging in guarding behavior, a rarity in Hymenoptera (Coville & Coville, 1980).

Trypoxylon is one of the genera of Hymenoptera facing taxonomic impediment due to outdated literature and a large number of species. However, *Trypoxylon* (*Trypargilum*) *nitidum* (Smith, 1856) is one of the most common species of subgenus found in Brazil, with distribution in all regions of the country (Muniz & Rosa, 2023). This species is also frequently observed nesting in trap nests (Matos et al., 2016; Nelson & Starr, 2016; Pires et al., 2012; Santoni et al., 2009).

Several genera of parasitoids from three orders (Hymenoptera, Diptera and Coleoptera) and different families are associated with *Trypoxylon* species (Perioto & Lara, 2018). Among the Hymenoptera, Ichneumonidae is one of the most diverse and numerous families within this order, with approximately 60,000 species described worldwide (Sime & Brower, 1998). Species in this family are known for their parasitoid behavior. Here, we

highlight the Neotropical genus *Photocryptus* Viereck, 1913 (Ichneumonidae; Cryptinae), which includes ten known species that parasitize only other species of aculeata wasps in nests made of mud or containing mud (Aguiar & Santos, 2009; Townes, 1970).

In this study, we documented the interaction between *Photocryptus concinnus* and *Trypoxylon nitidum* in a reused nest in the state of Pará, located in the Brazilian Amazon region.

MATERIAL AND METHODS

Observations and collection of the nest were carried out in March 2022 near a forested area on the research *campus* of the *Museu Paraense Emílio Goeldi* (MPEG) (1° 27' 06.1" S, 48° 26' 38.5" W) in Belém, Pará. The climate in the region is classified as equatorial - Af (Koeppen System), with an average temperature of 26.7 °C and an annual precipitation of 2.085 mm (Alvares et al., 2013; Climate-Data.org, 2022). The nest was carefully removed from the site using scissors to cut the substrate to which it was attached. It was then transported to the laboratory and stored in a transparent plastic recipient covered with organza at room temperature until the adult individuals emerged. The identification of the *Trypoxylon* species was conducted using the keys proposed by Richards (1934), while the identification of the parasitoid wasps was performed by Dr. Bernardo F. Santos.

The studied specimens will be deposited at the Entomological Collection of the MPEG, Brazil. Wasp images were captured using a Canon EOS 1000D digital camera with a Macro Lens EF100mm f/2.8 USM, while the nest images in the field and laboratory were taken with a Canon EFS 18-55mm lens. The images were stacked using Helicon Focus 8.1.1 Pro software.

RESULTS AND DISCUSSION

The nest (Figure 1) was built using a mixture of clay and sand, and attached to a vine suspended from the eaves of the roof, approximately four meters above the ground.

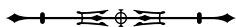




Figure 1. Nest reused by *Trypoxylon nitidum* (Crabronidae). Scale: 1 cm. Photos: Melquisedeque Valente Campos (2022).

It consisted of five cylindrical cells arranged in parallel, and the overall shape of the nest was ellipsoidal with small projections at the ends, measuring 2 to 3 cm along its longest axis. The cells were provisioned with complete small spiders.

Due to the material the nest is made of, it is not possible to open it without breaking it. We refrained from manipulating the nest in order to avoid disrupting the emergence of individuals. Since the nest is sealed, we were unable to determine the stage (egg, larva, or pupa) it was in, and it was not possible to quantify or identify the spider taxa or determine if they belonged to the same species. One day after collection, two individuals of *T. nitidum* (MPEG 03056146; MPEG 03056147) emerged, and thirty-seven days after collection, a female of *P. concinnus* (MPEG 03056148; MPEG 03056149) emerged (Figures 2A and 2B).

It was not possible to determine the species that constructed the nest. However, recently (May 2023), a nest of *Pachymenes ghilianii* (Spinola, 1851) was collected near the location where the mentioned nest was found, and it bears similarities to this nest in terms of nest



Figure 2. A) Female of *Photocryptus concinnus* (MPEG 03056149) in lateral view; B) female of *Trypoxylon nitidum* (MPEG 03056146) in lateral view. Scale: 0.5 mm. Photos: Melquisedeque Valente Campos (2022).

architecture pattern, overall shape, construction material, arrangement of cells, and the shape of the adult emergence opening. Nevertheless, other groups of Hymenoptera may also exhibit this nest configuration, including species from the genus *Trigonopsis* Perty, 1833 (Sphecidae), based on the construction material and parallel and horizontal arrangement of cells (G. A. R. Melo, personal communication, 2022).

We observed that the female *P. concinnus* uses her antennae to grope the nest and choosing the best place for oviposition. She then inserts the ovipositor, depositing the egg inside the chosen cell.

A biological synopsis of *Photocryptus*, conducted by Aguiar and Santos (2009), provides an overview of host records for the genus. The study reports new host associations, including *P. concinnus* as a nest parasitoid

building by *Trypoxylon* (*Trypoxylon*) *maidli* Richards, 1934 and *P. testaceus* (Taschenberg, 1876) as a nest parasitoid building by *Trypoxylon* (*Trypargilum*) *albitarse* Fabricius, 1804 and *T. (Trypargilum) nitidum*, in this last species it is not possible to determine if the nest was originally of this species or reused. All these association records of *P. concinnus* and *P. testaceus* with *Trypoxylon* species were made in Trinidad (Aguiar & Santos, 2009). Additionally, the study highlights interesting observations, such as multiple *Photocryptus* species attacking the same host nest and comparisons between ovipositor length and nest dimensions. While the association between *Photocryptus* wasps and *Trypoxylon* species has been previously documented, *T. nitidum* and *T. albitarse* were registered solely as hosts for *P. testaceus* (Aguiar & Santos, 2009).

CONCLUSION

Photocryptus concinnus has previously been documented as a parasitoid of other Hymenoptera species. However, this work presents the first record of *Photocryptus* parasitizing *Trypoxylon* in Brazil, as well as the first record of *P. concinnus* parasitizing *T. nitidum*. Therefore, this paper records another species of the genus *Trypoxylon* as host of *P. concinnus*. The occurrence of this association in a reused nest suggests that this parasitoid probably has the capability to parasitize the species that built the nest.

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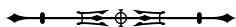
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AUTHORS' CONTRIBUTION

M. V. Campos contributed to project administration, formal analysis, acquisition of financing, conceptualization, data curation, methodology, resources, software, validation, preview, and writing (original draft writing, review and editing investigation); D. B. Muniz to data curation, validation, preview, and writing (review and editing); and O. T. Silveira to project administration, formal analysis, acquisition of financing, conceptualization, data curation, resources, supervision, validation, preview, and writing (review and editing).



