Revista Brasileira de Entomologia xxx (2017) xxx–xxx

SOCIEDADE BRASILEIRA DE ENTOMOLOGIA
FUNDADA EM 1937

REVISTA BRASILEIRA DE
Entomologia
A Journal on Insect Diversity and Evolution
www.rbentomologia.com

Biology, Ecology and Diversity

Elbella luteizona (Mabille, 1877) (Lepidoptera, Hesperiidae: Pyrginae) in Brazilian Cerrado: larval morphology, diet, and shelter architecture

Cintia Lepesqueur[a], Marina Neis[b], Neuza A.P. Silva[b,*], Thayane Pereira[a], Hanna Pâmela A. Rodrigues[a], Tácito Trindade[a], Ivone R. Diniz[a]

[a] *Universidade de Brasília, Instituto de Ciências Biológicas, Departamento de Zoologia, Brasília, DF, Brazil*
[b] *Universidade de Brasília, Instituto de Ciências Biológicas, Departamento de Ecologia, Brasília, DF, Brazil*

ARTICLE INFO

Article history:
Received 20 May 2017
Accepted 21 August 2017
Available online xxx
Associate Editor: Lucas Kaminski

Keywords:
Caterpillar
Host plants
Population dynamics
Skippers
Univoltine

ABSTRACT

This study examined temporal variation in the abundance of immature stages of *Elbella luteizona* (Hesperiidae) and describes the morphology and behavior of the larvae on their host plants, *Byrsonima coccolobifolia* and *Myrsine guianensis*. Five hundred sixty-eight 10 m diameter plots were searched for caterpillars in the Brazilian Cerrado over a period of one year. We inspected 5968 host plants, and found 31 eggs and 262 larvae on 244 plants. Similar numbers of immatures were found in both species of host plants. The abundance of immature stages varied monthly and was significantly higher in the dry season on both host plants, which may be due to the low density of natural enemies during that time. *E. luteizona* is univoltine, and larvae present relatively little morphological variation. However, during development, substantial changes occur in the architecture of leaf shelters that caterpillars construct. In addition, *E. luteizona* larvae develop very slowly, taking more than 300 days to complete metamorphosis.

Introduction

The family Hesperiidae (Papilionoidea) is comprised of about 4000 species, 567 genera, and seven subfamilies (Warren et al., 2009; Heikkilä et al., 2011; Van Nieukerken et al., 2011). In the Neotropics, 2365 species have been recorded, and 1165 species are known to occur in Brazil (see Mielke et al., 2008). In the Distrito Federal of Brazil, there are 335 species of Hesperiidae, which represent 14.2% of species globally and 28.8% of Brazilian Hesperiidae.

The tribe Pyrrhopygini (Pyrginae) is primarily Neotropical, being distributed from the southwest of the United States (Arizona, New Mexico, and Texas) to northern Argentina (Mielke, 1994). All known larvae and pupae of Pyrrhopygini are covered with long thin setae, a characteristic considered to be a synapomorphy of the tribe (Moss, 1949; Burns and Janzen, 2001). Larvae of Pyrrhopygina, a subtribe of which includes the genus *Elbella* Evans, 1951, the object of the present study, have dark teguments with yellow or orange stripes (Moss, 1949; Cock, 1982; Burns and Janzen, 2001). *Elbella* includes 22 recognized species, 16 of which occur in Brazil (Mielke, 2004, 2005). In the Distrito Federal, three species of *Elbella* have been recorded (Mielke et al., 2008): *E. luteizona* (Mabille, 1877), *E. azeta giffordi* Mielke, 1994, and *E. intersecta losca* Evans, 1951, which is endemic to the biome.

E. luteizona is a butterfly found also in the Brazilian states of Minas Gerais, São Paulo, Paraná, and Rio Grande do Sul (Mielke, 1994). In the Cerrado, more specifically in the Distrito Federal, the adults fly from January to April (Mielke, 1994), which is the second half of the region's wet season that lasts from October to April. Caterpillars of the species are polyphagous, feeding on leaves from at least two plant families, the Malpighiaceae (*Byrsonima coccolobifolia* Kunth) and Myrsinaceae (*Myrsine guianensis* (Aubl.) Kuntze) (Diniz and Morais, 1995; Diniz et al., 2001). However, host plant records for most of the larvae of *Elbella* species are still very scarce, except for species found in Costa Rica (Burns and Janzen, 2001). The larvae of Hesperiidae species construct and inhabit various types of leaf shelters—cuts, ties, rolls, and folds (Greeney and Jones, 2003; Greeney, 2009). The architecture of these shelters varies across genera and often between larval instars. However, shelter architecture is constant within a species (Weiss et al., 2003) and may thus be useful for species identification in the field (Greeney, 2009) as well as the evaluation of phylogenetic relationships between species (Greeney and Jones, 2003; Greeney and Warren, 2009a,b).

* Corresponding author.
E-mail: neuzaaps@gmail.com (N.A. Silva).

http://dx.doi.org/10.1016/j.rbe.2017.08.004

Please cite this article in press as: Lepesqueur, C., et al. *Elbella luteizona* (Mabille, 1877) (Lepidoptera, Hesperiidae: Pyrginae) in Brazilian Cerrado: larval morphology, diet, and shelter architecture. Rev. Brasil. Entomol. (2017). http://dx.doi.org/10.1016/j.rbe.2017.08.004

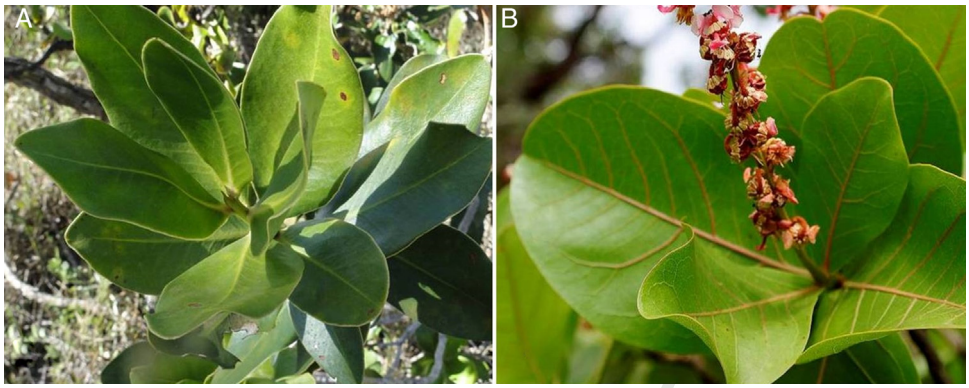

Fig. 1. *Elbella luteizona*, host plants in the Cerrado, Distrito Federal, Brazil. (A) *Myrsine guianensis*; (B) *Byrsonima coccolobifolia*.

The larval stages of the Hesperiidae are not well studied, and more information regarding caterpillar host plant selection is required. Knowledge of immature stages is needed for species conservation and for understanding ecological interactions. Data on caterpillar morphology may also help resolve taxonomic questions (Freitas and Brown, 2004). Thus, in this work we studied the ecology and biology of *E. luteizona*. We examined the temporal variation in the abundance of immature stages on *B. coccolobifolia* and *M. guianensis* in the Cerrado, and describe the morphology of eggs, larvae and pupae of this species for the first time. In addition, we analyzed the behavior of different larval instars in relation to the architecture of their shelters in the field and in the laboratory.

Material and methods

Study area

This study was conducted between August 2011 and May 2013 in Cerrado *sensu stricto* at the *Fazenda Água Limpa* (FAL; 15°55′ S and 47°55′ W), an experimental farm belonging to the *Universidade de Brasília* (UnB), and at the *Reserva Ecológica do Roncador* of the *Instituto Brasileiro de Geografia e Estatística* (RECOR, IBGE; 15°56′ S and 47°53′ W) in the Distrito Federal (DF), Brazil. Both areas are preserved and form part of the 20,000 ha *Gama e Cabeça de Veado* Environmental Protection Area. The region, at an altitude of ∼1050 m, has two marked seasons—dry (May to September) and wet (October to April). During the study period, the total precipitation of the dry season was 155 mm, while in the wet season it was 1381 mm.

Host plants

We searched for *E. luteizona* in *B. coccolobifolia* (Fig. 1A) and *M. guianensis* (Fig. 1B). The first species is deciduous and widely distributed in the Cerrado (Ratter et al., 2003). Leaf production and loss are not synchronized and occur at the end of the dry season or in the dry/wet season transitions (September and October) (Morais et al., 1995). The plant has small hairy, pink leaves when young, and they become dark green and glabrous as they age. Flowering occurs from December to February (Silva Júnior, 2005). *M. guianensis*, an evergreen tree species with continuous growth (Lenza and Klink, 2006), is found in different vegetation types in the Cerrado. It has fleshy, concolorous, glabrous leaves which are shiny on their adaxial surface but opaque on the abaxial surface, and extrafloral nectaries (Oliveira and Leitão-Filho, 1987). The species flowering period is from September to December (Silva Júnior, 2005).

Collection and rearing

We used a standardized method for surveys and caterpillar collection, following Dyer et al. (2010), i.e., plots of 10 m in diameter. We sampled 568 temporary plots—263 in the wet season and 305 in the dry season. Plots were centered around one of the host plant species (*B. coccolobifolia* or *M. guianensis*), and four strings of five meters were extended in a cross from the center plant to delineate the plot. No plant was surveyed more than once, and at least 5 m separated the plots.

In each plot, all plants of each host species 0.2– 2 m tall were counted and inspected for eggs, larvae and pupae of *E. luteizona.* All immature stages found in the field were collected and taken to the *Laboratório de Biologia de Insetos Herbívoros*/UnB, where they were reared in individual plastic containers under ambient conditions. The larvae were fed on the leaves of the species upon which they were found. Every two days, the rearing containers were inspected for cleaning, new leaves were added if necessary, and egg hatching, larval instar changes, the construction of new shelters, pupation, and adult or parasitoid emergence was recorded. Concurrently, 40 individuals of *M. guianensis* which had 45 larvae of different instars in shelters were tagged in the field. Records of the behavior of these specimens on the host plant in the field were made every two days.

Eggs, the width of caterpillar cephalic capsules, and general morphological larval traits were analyzed using a Leica® S8APO stereomicroscope with an attached micrometric scale. Measurements are presented as minimum and maximum values. Eggs and larvae of the first instar were prepared for scanning electron microscopy (SEM) which was conducted using a JEOL® JSM 7001 F. The samples were fixed in Kahle's solution and subsequently immersed for thirty minutes in acetone at increasing concentrations (50, 70, 90, and 100%) to dehydrate samples prior to SEM analyses. Dehydration was completed in Balzers CPD 030 after eggs and larvae were mounted on double-sided tape on metallic plates and coated with gold in a metallizer (Leica® EM-SCD 500). Morphological terminology is based on Stehr (1987). Immature stages and adult voucher specimens were deposited in the *Coleção Entomológica do Departamento de Zoologia*/UnB.

Results

Ecology and biology of E. luteizona

We inspected 5968 plants (5466 individuals of *M. guianensis* and 502 of *B. coccolobifolia*) in 568 plots; there were on average15.2 and 2.8 individuals of *M. guianensis* and *B. coccolobifolia* per plot, respectively. Thirty-one eggs and 262 larvae of *E. luteizona* were found on 244 plants; only 4.1% of the plants searched were host to caterpillars at the time of sampling (Table 1). The larvae did not show

Please cite this article in press as: Lepesqueur, C., et al. *Elbella luteizona* (Mabille, 1877) (Lepidoptera, Hesperiidae: Pyrginae) in Brazilian Cerrado: larval morphology, diet, and shelter architecture. Rev. Brasil. Entomol. (2017). http://dx.doi.org/10.1016/j.rbe.2017.08.004