

# Immature stages of *Chloreuptychia marica* (Weymer, 1911) (Lepidoptera: Nymphalidae: Satyrinae: Satyrini)

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Date of issue online: 29 October 2021

Electronic copies (ISSN 2575-9256) in PDF format at: <http://journals.fcla.edu/troplep>; <https://zenodo.org>; archived by the Institutional Repository at the University of Florida (IR@UF), <http://ufdc.ufl.edu/ufir>; DOI: 10.5281/zenodo.5600408

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**Abstract:** We here describe the immature stages of a rare Neotropical satyrine butterfly, *Chloreuptychia marica* (Weymer, 1911), with a report of its natural hostplant based on two individuals reared in southwestern Amazonia (Madre de Dios, Peru). Two eggs obtained in nature passed through four larval instars and reached the adult stage, and the hostplant was identified as *Pariana lunata* Nees (Poaceae: Bambusoideae: Olyreae), a species of herbaceous bamboo. Images of each stage, as well as their duration, are provided herein, and we also illustrate the head capsules of the first and third instars.

**Resumen:** Se describen las etapas inmaduras de una mariposa satyrina Neotropical rara, *Chloreuptychia marica* (Weymer, 1911), y se reporta de su planta hospedera nativa, basadas en dos individuos criados al suroeste de la Amazonía (Madre de Dios, Perú). Dos huevos recolectados en el área de estudio pasaron por cuatro estadios larvarios y alcanzaron la etapa adulta, identificándose como planta hospedera a *Pariana lunata* Nees (Poaceae: Bambusoideae: Olyreae), una especie de bambú herbáceo. Se proporcionan imágenes de cada estadio, su duración y también de las cápsulas de la cabeza del primer y tercer estadio.

**Key words:** Euptychiina, life history, Madre de Dios, Peru

**Palabras claves:** Euptychiina, estadios inmaduros, Madre de Dios, Perú

## INTRODUCTION

Members of the nymphalid subtribe Euptychiina comprise a diverse radiation that is especially characteristic of lowland habitats in the Neotropics, with a few exceptions such as the Asian taxon *Paleonympha opalina* Butler, 1871 (Peña *et al.*, 2010). The group was recovered as monophyletic in a recent molecular phylogenetic study (e.g., Espeland *et al.*, 2019), and apart from species in the genus *Euptychia* Hübner, 1818, known hostplant records are mostly confined to bamboo or grasses in the family Poaceae, with several taxa using other families of monocots (e.g., Beccaloni *et al.*, 2008; Janzen & Hallwachs, 2018).

As indicated in a number of phylogenetic studies, the genus *Chloreuptychia* Forster, 1964 is highly polyphyletic (Espeland *et al.*, 2019; Nakahara *et al.*, 2019). The establishment of *Amiga* Nakahara, Willmott & Espeland, 2019 for *Papilio arnaca* Fabricius, 1776 was the first step towards resolving the classification of species formerly placed in *Chloreuptychia* and study is underway to propose new taxonomic hypotheses for remaining taxa still associated with *Chloreuptychia*.

*Euptychia marica* Weymer, 1911 was described by Gustav Weymer based on an unspecified number of specimens from Pebas, Peru (Weymer, 1911). This taxon was transferred to *Chloreuptychia* by Walter Forster when he established over 30 new euptychiine genera in the “Satyridae” part of *Beiträge zur Kenntnis der Insektenfauna Boliviens* series. Although Forster’s classification lacked a phylogenetic framework, the Lamas (2004) checklist retained this classification and the species’s placement in *Chloreuptychia* is currently widely accepted (e.g., Warren *et al.*, 2020). Nevertheless, a multi-collaborative, ongoing molecular phylogenetic study of the subtribe Euptychiina (see <https://www.floridamuseum.ufl.edu/museum-voices/euptychiina>) found *Chloreuptychia marica* to be a member of the so-called “*Archeuptychia* clade” (*sensu* Espeland *et al.*, 2019), distantly related to the type species of the genus as implied in Nakahara *et al.* (2018), coupled with an ongoing molecular phylogenetic study (unpublished data). It is also worth mentioning that this species is rare in collections, judging from the number of specimens databased from over 50 public and private collections for the aforementioned Euptychiina project. However, existing museum specimens

and literature (e.g., Brévignon & Benmesbah, 2012) suggests it is widely distributed in the Amazon basin. Due to this effort in unraveling the systematics of Euptychiina, the generic classification of this diverse radiation is reaching some degree of stability, although our understanding of the life history information of many euptychiines is still far from complete, as highlighted in a number of studies (e.g. Nakahara *et al.*, 2020). Indeed, we see a number of relevant studies aimed at filling in this gap of knowledge regarding euptychiine early stage biology published regularly, indicating our lack of knowledge in this area (e.g., Freitas, 2003, 2004, 2007, 2017; Freitas & Peña, 2006; Freitas *et al.*, 2016a,b, 2018; Kaminski & Freitas, 2008; Cosmo *et al.*, 2014; See *et al.*, 2018; Baine *et al.*, 2019; Nakahara *et al.*, 2020). In particular, almost nothing is known about the early stage biology of species in the “*Archeuptychia* clade”, with an exception of some limited information (e.g., Singer & Ehrlich, 1991).

Given the need for better knowledge of euptychiine early stage biology, we here document the immature stages of *Chloreuptychia marica*, including information on its natural hostplant, as part of an ongoing effort to rear butterfly species at Finca Las Piedras (FLP) (see See *et al.*, 2018; Baine *et al.*, 2019; Nakahara *et al.*, 2020). The present study is the first to report the complete immature stages of a species in the “*Archeuptychia* clade”, and thus we report this documentation prior to the formal generic assessment of *Chloreuptychia marica*.

## MATERIALS AND METHODS

### Study site and rearing

The study was carried out at Finca las Piedras (FLP), a 54-ha biological research station located 48 km north of the city of Puerto Maldonado, department of Madre de Dios, Peru (-12.22789, -69.11119; ca. 240 m) in the southwestern part of the Amazon basin. The site is comprised of largely intact upland or *terra firme* lowland Amazonian rainforest and swamps dominated by the palm *Mauritia flexuosa*. For more information about FLP, consult relevant sections of See *et al.* (2018), Baine *et al.* (2019) and Nakahara *et al.* (2020).

Fieldwork was carried out on the FLP property between the months of January to August 2020 as part of the long-term Lepidoptera Diversity and Biology project led by the Alliance for a Sustainable Amazon (<https://www.sustainableamazon.org/>). The collected immatures were reared at the FLP field laboratory in individually-labeled 1 L plastic containers with voucher codes 2020\_FLP\_IMM\_0184A and 2020\_FLP\_IMM\_185, and covered by a cloth held with an elastic band. The leaves of the hostplant were preserved in floral water tubes (Aquapic, Floral Supply) and exchanged for new leaves every two days or as otherwise needed. Immatures were photographed using Nikon D7100 digital camera with Tokina Macro100 F2.8 D AT-X Pro lens. The emerged adults, head capsules, and exuviae were collected in cross-labeled envelopes and stored and preserved in containers with silica gel.

### Morphological study

Observations of the head capsules were done using a Leica LED2500 stereomicroscope with magnification ranging from

10x to 160x. The head capsule drawings were made with Adobe illustrator CC 2015. All morphological examinations relevant to this study were conducted at Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru.

## RESULTS

A total of 13 eggs were collected on a herbaceous bamboo species *Pariana lunata* Ness (Poaceae: Bambusoideae: Olyreae) at FLP. Two individuals (2020\_FLP\_IMM\_0184A and 2020\_FLP\_IMM\_0185) both passed through four instars and reached the adult stage which enabled identification; the dates for recorded molts are as follows: individual 1) 2020\_FLP\_IMM\_0184A: date of egg collection - 20 June 2020; egg hatch - 23 June 2020; L1 to L2 - 3 July 2020; L2 to L3 - 11 July 2020; L3 to L4 - 17 July 2020; pupation - 4 August 2020; adult eclosion - 18 August 2020; individual 2) 2020\_FLP\_IMM\_0185: date of egg collection - 20 June 2020; egg hatch - 24 June 2020; L1 to L2 - 6 July 2020; L2 to L3 - 14 July 2020; L3 to L4 - 19 July 2020; pupation - 16 August 2020; adult eclosion - 29 August 2020.

**Hostplant** (Fig. 1a-c): The natural hostplant is a herbaceous bamboo identified as *Pariana lunata* Ness (Poaceae). The plant (georeferenced and vouchered as HP451) where the eggs were found was located near the edge of *terra firme* forest dominated by Brazil nut (*Bertholletia excelsa*, Lecythidaceae) trees, in an area of significant disturbance and influx of light (Fig. 1a). In these conditions, grasses were particularly abundant in the understory. Two eggs (2020\_FLP\_IMM\_184A and B) were found on the distal third of the abaxial surface of a leaf, approximately 30 cm above the ground. One egg (2020\_FLP\_IMM\_0185) was found on the middle third of the abaxial surface of a leaf. All three of these eggs were found on 20 June 2020 on the same plant.

**Egg** (Figs 2a, b): Spherical, smooth, whitish, with rather indistinct concave hexagonal facets, larvae (head capsule) visible through transparency 1 day before hatching; diameter 1.1 mm (all measurements are approximate). Duration 3-4 days (n = 2) from collection.

**First instar** (Fig. 2c, 3): Head capsule width 0.6 mm (n = 1; 2020\_FLP\_IMM\_0184A). Head blackish, two rounded stubby scoli with pair of hair-like (i.e. thread-like) setae visible; six chalazae present (three on each side), each with a single seta, six stemmata present, the third being the largest among these six; body light green, posteriorly paler; no visible stripes; multiple long setae visible dorsally and laterally on each segment; short bifid caudal filaments visible, white. Duration: 10-12 days (n = 2).

**Second instar** (Fig. 2d): Head capsule width 1.0 mm (n=1; 2020\_FLP\_IMM\_0184A). Head virtually concolorous to that of first instar, scoli developed and appearing “horn-like” as opposed to stubby scoli of first instar; six whitish chalazae visible laterally (three on each side), six stemmata present, in arrangement similar to first instar; body dark green; a pair of well defined thick white stripes visible laterally, caudal filaments developed, pinkish dorsally, slightly shorter than head scoli length. Duration: 8 days (n = 2).

**Third instar** (Fig. 2e, 3): Head capsule width 1.4 mm (n=1; 2020\_FLP\_IMM\_0184A). Head morphologically similar to second instar, but grayish, apical part of head scoli darker, brown stripes present in area between head scoli and area surrounding chalazae, eight yellowish chalazae laterally (four on each side); body light green, becoming darker towards end of third instar; pair of well-defined broad white stripes laterally and dorsally, and a few indistinct narrow whitish stripes laterally; caudal filaments developed and pinkish dorsally, slightly shorter than head scoli in length. Duration: 5-6 days (n = 2).



**Figure 1.** Habitat and the hostplant, *Pariana lunata* (Poaceae: Bambusoideae: Olyreae), of *Chloreuptychia marica*: a) general view of the habitat where the hostplant was found (location of hostplant circled in red); b) close-up view of the hostplant; c) detail of leaves and nodes.

**Fourth (last) instar** (Fig. 2f): Head capsule width 1.6 mm ( $n=1$ ; 2020\_FLP\_IMM\_0185). Head morphologically similar to previous two instars, except somewhat darker; body creamy-white; a pair of well-defined light yellow stripes laterally (and presumably dorsally) but apparently poorly defined at both ends, well-defined dark red stripe in lateral view below this yellow stripe, as well as a few indistinct narrow whitish stripes; caudal filament virtually concolourous to that of third instar but inner area not discernible, slightly shorter than head scoli in length. Duration: 18-26 days ( $n = 2$ ).

**Pupal stage** (Figs 2g, h): Total length in vertical axis approximately 10 mm. Short and rounded, light brownish, spotted with black in parts, dorsally more densely, less densely in wing case with only a pair of black spots; ocular caps not prominent; two rows of small, blackish protuberances with orange and whitish coloration present along dorsal surface of abdomen; cremaster short and broad, somewhat rectangular. Duration: 13-14 days ( $n = 2$ ).

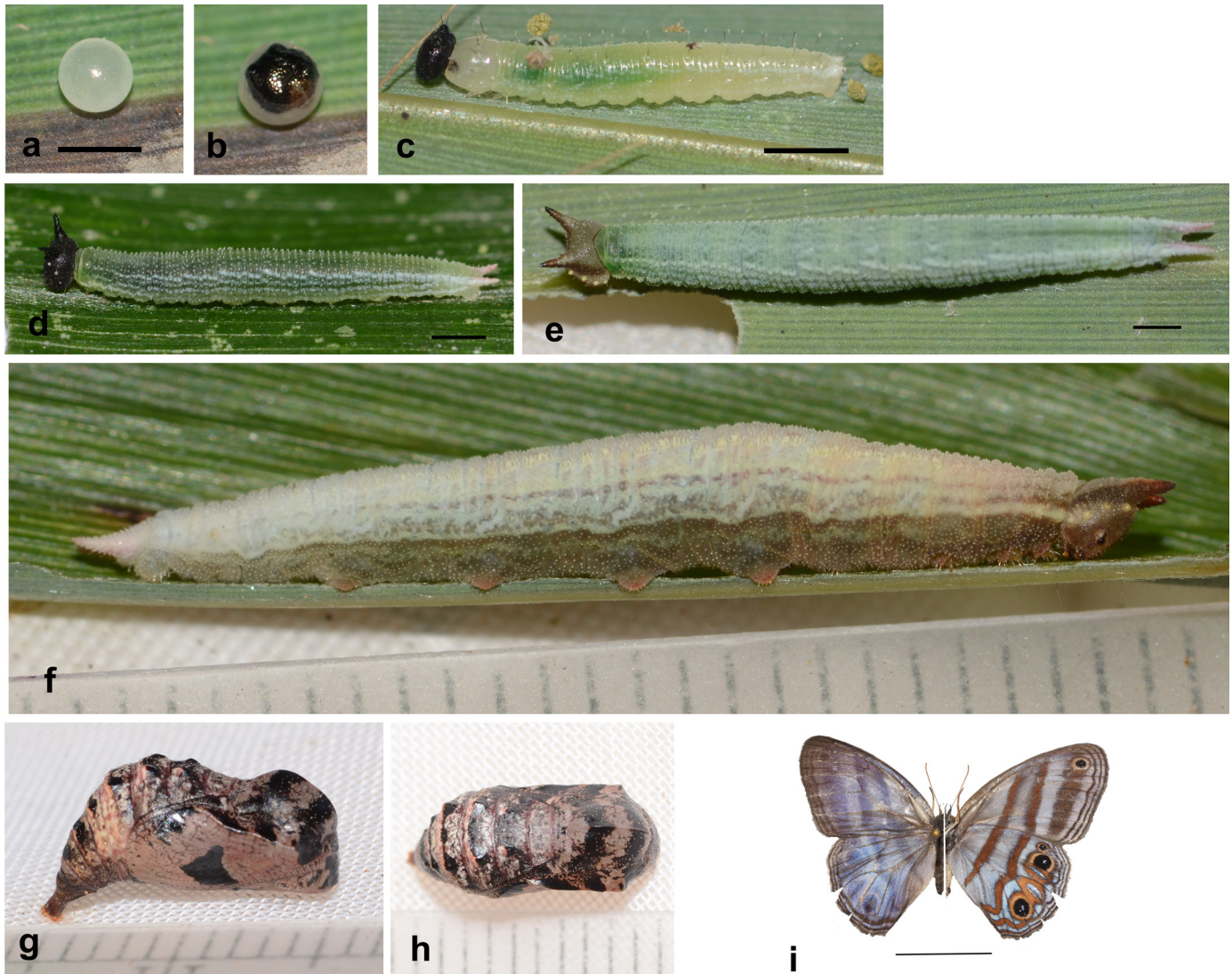
## DISCUSSION

We here report for the first time the complete immature stage life cycle of *Chloreuptychia marica* with information on its natural hostplant, based on two individuals reared in southern Peru. Many euptychiine hostplant records consist of “unidentified bamboo” or “unidentified grass” (e.g., Beccaloni *et al.*, 2008; Freitas, 2017). Here, a herbaceous bamboo identified as *Pariana lunata* Ness is recorded as a hostplant for the subtribe Euptychiina for the first time. Even with the complex taxonomy of the genus *Pariana*, identification of the

hostplant to species was possible based on available images (Lynn Clark and Fabricio Ferreira, pers. comm.). Nevertheless, since this genus has been found to be monophyletic in a recent phylogenetic study (Ferreira *et al.*, 2019), a hostplant identification even at the generic level is already significant. We would like to emphasize that all relevant voucher specimens at FLP will be collected and these materials are the subjects of morphological and genetic study.

This is the first documentation of the complete immature stage life cycle of a euptychiine species currently recovered as part of the so-called “*Archeuptychia* clade”. In general, the immature stages of *Chloreuptychia marica* resemble those of many other euptychiines (e.g., Singer *et al.*, 1983; Freitas, 2003, 2004, 2007, 2017; Freitas & Peña, 2006; Freitas *et al.*, 2016a,b, 2018; Kaminski & Freitas, 2008; Cosmo *et al.*, 2014; See *et al.*, 2018; Baine *et al.*, 2019; Nakahara *et al.*, 2020). Perhaps one notable feature is the dark head of the second instar (which is similar to the first instar), whereas in many euptychiine larvae the head is paler in the second instar in comparison to the first (see aforementioned references), although a few exceptions are known such as *Pareuptychia ocirrhoe* (Fabricius, 1776) (Freitas *et al.*, 2016a) and *Splendeuptychia quadrina* (Butler, 1869) (See *et al.*, 2018). Another seemingly unusual character is the appearance of additional chalazae in the third and fourth instar

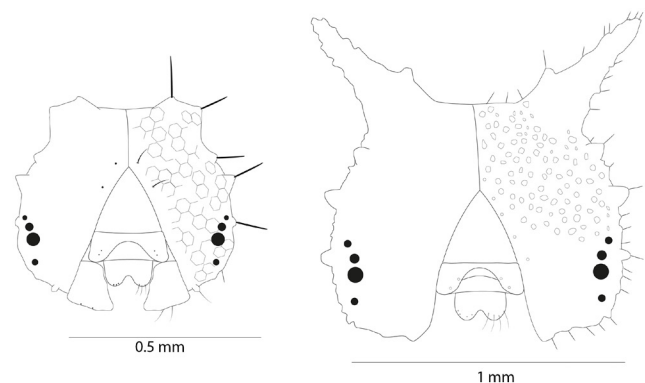




**Figure 2.** Immature stages and adult of *Chloreuptychia marica*: a) egg; b) egg with visible head capsule; c) first instar in dorso-lateral view; d) second instar in dorso-lateral view; e) third instar in dorso-lateral view; f) fourth instar in lateral view; g) pupa in lateral view and h) dorsal view; i) adult female. (a) (b) and (i) based on 2020\_FLP\_IMM\_0185, remaining images are based on 2020\_FLP\_IMM\_0184A. a, c, d, e, scale bar = 1 mm; i, scale bar = 10 mm.

(visible as yellow spots in Figs 2e, f), increasing the number from six to eight in these two larval instars (four on each side), also visible in *P. ocirrhoe* (Freitas *et al.*, 2016a). An undescribed species closely related to *Magneuptychia lea* (Cramer, 1779) is the only other known species in the “*Archeuptychia* clade” for which partial immature stage life cycle information (second instar onwards) is available (unpublished data). The head scoli of this undescribed species are somewhat bifurcating in the second and third instar, then transforming into short, stubby and blunt scoli in the fourth instar (Nakahara *et al.*, in prep.). On the other hand, the scoli of *Chloreuptychia marica* are “horn-like” throughout the second to fourth instar, as observed in many other euptychiine species such as *Splendeuptychia quadrina* (Butler, 1869) and *Magneuptychia harpyia* (C. Felder & R. Felder, 1867) (See *et al.*, 2018; Nakahara *et al.*, 2020). Interestingly, the last (4th) instars of both species are creamy-white, a rather unusual character for a euptychiine larva, although the lack of life history information of other taxa in the “*Archeuptychia* clade” hinders assessment of how uniform this character is across the

clade. The ultimate instar of five *Moneuptychia* Forster, 1964 species (Freitas, 2007; Freitas *et al.*, 2015, 2018) also appear to possess whitish to grayish body coloration, and thus this rather



**Figure 3.** Head capsule in frontal view, first instar to the left (based on 2020\_FLP\_IMM\_0185), third instar to the right (based on 2020\_FLP\_IMM\_0184A).

pale body coloration might have evolved independently across distantly related euptychiine taxa. Clearly, an accumulation of immature stage descriptions and hostplant records will be valuable not only for discovering phylogenetically informative immature stage morphological characters, but also contribute towards a better understanding of the trophic interactions in the biodiverse forests of the Neotropical region.

#### ACKNOWLEDGMENTS

We are grateful to Fabricio Ferreira and Lynn Clark for kindly identifying the hostplant; Keith Willmott and André Freitas for reviewing the manuscript post-submission. The authors would like to thank Peru's Servicio Nacional Forestal y de Fauna Silvestre (SERFOR) for granting permission to conduct the field research (permit number: 187-2017-SERFOR/DGGSPFFS). SN acknowledges the University of Florida's Entomology and Nematology Department and Alliance for a Sustainable Amazon for support. MRM thanks Diana Silva and Gerardo Lamas for allowing her to use the facilities of the Entomology Department (MUSM) during this research.

#### LITERATURE CITED

- Baine, Q., Polo-Espinoza, G., Nakahara, S., Gallice, G. 2019. Immature stages and new host record of *Taygetis rufomarginata* Staudinger, 1888 (Lepidoptera: Nymphalidae: Satyrinae). *Tropical Lepidoptera Research* 29(2): 79-86.
- Brévignon, C., Benmesbah, M. 2012. *Complément à l'inventaire des Satyrinae de Guyane (Lepidoptera: Nymphalidae)*, pp. 36-52. In: Lacomme, D., Manil, L. (Eds.), *Lépidoptères de Guyane. Tome 7. Nymphalidae*. Paris, Association des Lépidoptéristes de France.
- Cosmo, L. G., Barbosa, E. P., Freitas, A. V. L. 2014. Biology and morphology of the immature stages of *Hermeuptychia atalanta* (Lepidoptera: Nymphalidae: Satyrinae). *Annales de la Société Entomologique de France* 50(1): 82-88.
- Espeland, M., Breinholt, J. W., Barbosa, E. P., Casagrande, M. M., Huertas, B., Lamas, G., Marín, M. A., Mielke, O. H. H., Miller, J. Y., Nakahara, S., Tan, D., Warren, A. D., Zacca, T., Kawahara, A. Y., Freitas, A. V. L., Willmott, K. R. 2019. Four hundred shades of brown: Higher level phylogeny of the problematic Euptychiina (Lepidoptera, Nymphalidae, Satyrinae) based on hybrid enrichment data. *Molecular Phylogenetics and Evolution* 131: 116-124.
- Ferreira, F. M., Oliveira, R. P., Welker, C. A. D., Dórea, M. C., Lima, A. L. C., Oliveira, I. L. C., Santos, F. A. R., van den Berg, C., Clark, L. G. 2019. Phylogenetic relationships within Parianinae (Poaceae: Bambusoideae: Olyreae) with emphasis on *Eremitis*: evidence from nuclear and plastid DNA sequences, macromorphology, and pollen ectexine patterns. *Molecular Phylogenetics and Evolution* 139: 106541.
- Forster, W. 1964. Beiträge zur Kenntnis der Insektenfauna Boliviens XIX. Lepidoptera III. Satyridae. *Veröffentlichungen der Zoologischen Staatssammlung München* 8: 51-88.
- Freitas, A. V. L. 2003. Description of a new genus for "*Euptychia*" *peculiaris* (Nymphalidae: Satyrinae): Immature stages and systematic position. *Journal of the Lepidopterists' Society* 57: 100-106.
- Freitas, A. V. L. 2004. Immature stages of *Amphidecta reynoldsi* (Nymphalidae: Satyrinae). *Journal of the Lepidopterists' Society* 58(1): 53-55.
- Freitas, A. V. L. 2007. A new species of *Moneuptychia* Forster (Lepidoptera: Satyrinae, Euptychiina) from the highlands of southeastern Brazil. *Neotropical Entomology* 36: 919-925.
- Freitas, A. V. L. 2017. Immature stages of the Neotropical satyrine *Taygetis acuta* (Nymphalidae: Euptychiina). *Tropical Lepidoptera Research* 27: 1-5.
- Freitas, A. V. L., Barbosa, E. P., Marin, M. A. 2016a. Immature stages and natural history of the neotropical satyrine *Pareuptychia ocirrhoe interjecta* (Nymphalidae: Satyrinae). *Journal of the Lepidopterists' Society* 70(4): 271-276.
- Freitas, A. V. L., Barbosa, E. P., Siewert, R. R., Mielke, O. H. H., Zacca, T., Azeredo-Espin, A. N. 2015. Four new species of *Moneuptychia* (Lepidoptera: Satyrinae: Euptychiina) from Brazil. *Zootaxa* 3981(4): 521-541.
- Freitas, A. V. L., Carreira, J. Y. O., Santos, J. P., Barbosa, E. P. 2016b. Immature stages and natural history of two species of *Forsterinaria* from southeastern Brazil (Lepidoptera: Nymphalidae). *Tropical Lepidoptera Research* 26(1): 13-18.
- Freitas, A. V. L., Peña, C. 2006. Description of genus *Guaianaza* for "*Euptychia*" *pronophila* (Lepidoptera: Nymphalidae: Satyrinae) with a description of the immature stages. *Zootaxa* 1163: 49-59.
- Freitas, A. V. L., Rosa, A. H. B., Carreira, J. Y. O., Gueratto, P. E., Santos, J. P., Tacioli, A. 2018. Immature stages of two *Moneuptychia* from southeastern Brazil (Nymphalidae: Euptychiina). *Tropical Lepidoptera Research* 28(2): 100-105.
- Janzen, D. H., Hallwachs, W. 2018. *Dynamic Database for an Inventory of the Macro-caterpillar Fauna, and its Food Plants and Parasitoids, of the Area de Conservacion Guanacaste (ACG), Northwestern Costa Rica*. Philadelphia, University of Pennsylvania. <http://janzen.sas.upenn.edu>. Accessed: February 2021.
- Kaminski, L. A., Freitas, A. V. L. 2008. Immature stages of the butterfly *Magneuptychia libye* (Linnaeus) (Lepidoptera: Nymphalidae: Satyrinae). *Neotropical Entomology* 37: 169-172.
- Lamas, G. 2004. *Nymphalidae. Satyrinae. Tribe Satyrini. Subtribe Euptychiina*, pp. 217-223. In: Lamas, G. (Ed.), *Checklist: Part 4A. Hesperioidea - Papilionoidea*. In: Heppner, J. B. (Ed.), *Atlas of Neotropical Lepidoptera. Volume 5A*. Gainesville, Association for Tropical Lepidoptera; Scientific Publishers.
- Nakahara, S., Hoffman, F. L. A., Hoffman, F. L., Gallice, G. 2020. Immature stages of *Magneuptychia harpyia* (C. Felder & R. Felder, 1867) (Lepidoptera: Nymphalidae: Satyrinae). *Tropical Lepidoptera Research*, 30(1): 33-38.
- Nakahara, S., Lamas, G., Tyler, S., Marín, M. A., Huertas, B., Willmott, K. R., Mielke, O. H. H., Espeland, M. 2019. A revision of the new genus *Amiga* Nakahara, Willmott & Espeland, gen. n., described for *Papilio arnaca* Fabricius, 1776 (Lepidoptera, Nymphalidae, Satyrinae). *ZooKeys* 821: 85-152.
- Nakahara, S., Willmott, K. R., Mielke, O. H. H., Schwartz, J., Zacca, T., Espeland, M., Lamas, G. 2018. Seven new taxa from the butterfly subtribe Euptychiina (Lepidoptera: Nymphalidae: Satyrinae) with revisional notes on *Harjesia* Forster, 1964 and *Pseudeuptychia* Forster, 1964. *Insecta Mundi* 0639: 1-38.
- See, J., Nakahara, S., Gallice, G. 2018. Immature stages of *Splendeuptychia quadrina* (Butler, 1869) (Lepidoptera: Nymphalidae: Satyrinae). *Tropical Lepidoptera Research* 28(2): 49-53.
- Singer, M. C., DeVries, P. J., Ehrlich, P. R. 1983. The *Cissia confusa* species group in Costa Rica and Trinidad (Lepidoptera: Satyrinae). *Zoological Journal of the Linnean Society* 79(2): 101-119.
- Singer, M. C., Ehrlich, P. R. 1991. Host specialization of satyrine butterflies, and their responses to habitat fragmentation in Trinidad. *Journal of Research on the Lepidoptera* 30(3/4): 248-256.
- Weymer, G. 1911. 4. Familie: Satyridae, pp. 173-192. In: Seitz, A. (Ed.), *Die Gross-Schmetterlinge der Erde. Volume 5*. Stuttgart, A. Kernen.