

Scientific Note: Reinstatement of *Euptychia sericeella* Bates, 1865: *Amiga sericeella* stat. rev., with *corrigenda* to Nakahara *et al.* (2019) (Lepidoptera: Nymphalidae: Satyrinae)

Shinichi Nakahara^{1,2,3*} & Robert Gallardo⁴

1. McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611, USA

2. Department of Entomology and Nematology, University of Florida, Gainesville, FL 32611, USA

3. Departamento de Entomología, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru

4. La Union Suyapa, Las Vegas, Santa Barbara, Honduras

*email: snakahara@ufl.edu

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Nakahara *et al.* (2019a) was the first attempt towards revising the systematics of the highly polyphyletic nymphalid genus *Chloreuptychia* Forster, 1964, placed in the subtribe Euptychiina, by describing a monotypic genus, *Amiga* Nakahara *et al.* 2019 in order to harbor *Papilio arnaca* Fabricius, 1776 - a species unrelated to the type species of *Chloreuptychia*, *Papilio chloris* Cramer, 1780. Here, a taxon newly treated as a subspecies of *Amiga arnaca* in Nakahara *et al.* (2019a), is restored once more to a species-level taxon, increasing the species diversity of *Amiga* to two.

Despite its long-standing specific status for over 150 years, Nakahara *et al.* (2019a) regarded *Euptychia sericeella* Bates, 1865 as a subspecific taxon, for the first time, mainly due to there being no known area of sympatry between *Amiga arnaca adela* Nakahara & Espeland, 2019 and *Amiga arnaca sericeella* (Bates, 1865). Furthermore, in an analysis of DNA barcoding data, Central American *A. arnaca adela* (which show only slight morphological differences in comparison to *A. a. arnaca*) were sister to *A. a. sericeella*, suggesting that the latter taxon was not particularly divergent from remaining *A. arnaca*. Nakahara

et al. (2019a) thus stated “this null hypothesis [i.e., treating *A. a. sericeella* as a subspecies] remains to be more strongly tested when new evidence, such as distributional, behavioral, or genetic data, becomes available”. Coincidentally, shortly after the publication of Nakahara *et al.* (2019a), RG reported finding phenotypes apparently corresponding to both *A. a. adela* and *A. a. sericeella* at Río Plátano Biosphere Reserve, situated in eastern Honduras (Fig. 1). *Amiga a. adela* was more common along a ridgeline from 760–915 m, while *A. sericeella* was more common at lower elevations around 240 m, suggesting some possible differences in habitat preference. This discovery of sympatry of these two taxa provides a vital piece of evidence which we did not have during the course of preparing Nakahara *et al.* (2019a). It is worth noting that these records from Río Plátano Biosphere Reserve represent range extensions for both taxa, namely extending the known range of *A. arnaca sericeella* eastwards and *A. arnaca adela* northwards (Fig. 2).

Given its sympatry with *A. a. adela* at Río Plátano Biosphere Reserve, and the fact that the two taxa remain strongly differentiated by DNA barcodes (Fig. 3), we here restore *Amiga*



Figure 1. *Amiga arnaca adela* (left) and *A. sericeella* stat. rev. (right), in nature. Both photographed by A. Rivera at Río Plátano Biosphere Reserve, Honduras.

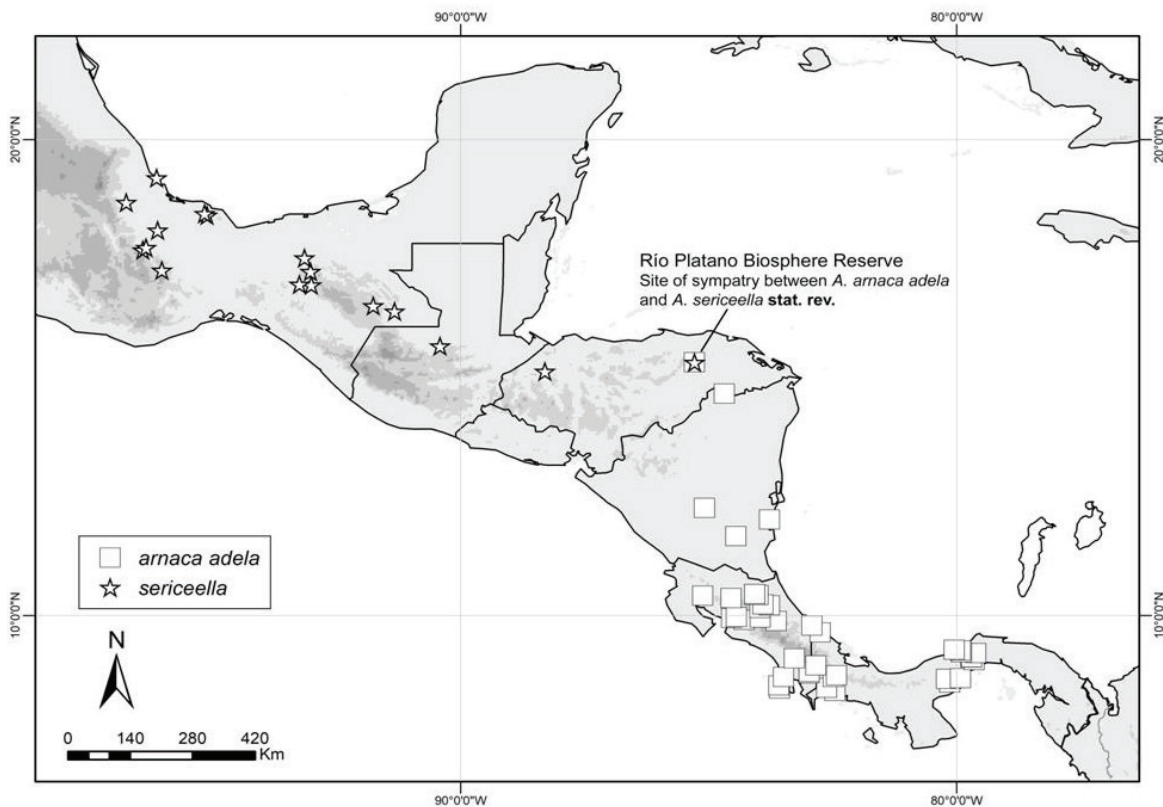


Figure 2. An updated distribution map for *A. sericeella* stat. rev. and *A. arnaca adela*, in addition to a photograph of the primary broadleaf forest in the southern section of the Rio Platano Biosphere Reserve, taken by A. Rivera (around 900 m).

arnaca sericeella to specific status, *Amiga sericeella* stat. rev. One individual of *Amiga sericeella* and two individuals of *Amiga arnaca adela* from this site (see “Examined Specimens” for further data) were “barcoded” following the methods for molecular work described in Nakahara *et al.* (2019a). These

three sequences (GenBank Accession numbers: MN717175, MN717176, MN717177) were incorporated in the matrix used in Nakahara *et al.* (2019a) and the genetic distances among 39 *Amiga* taxa were calculated using the method described in the aforementioned article. Based on this updated matrix, we provide

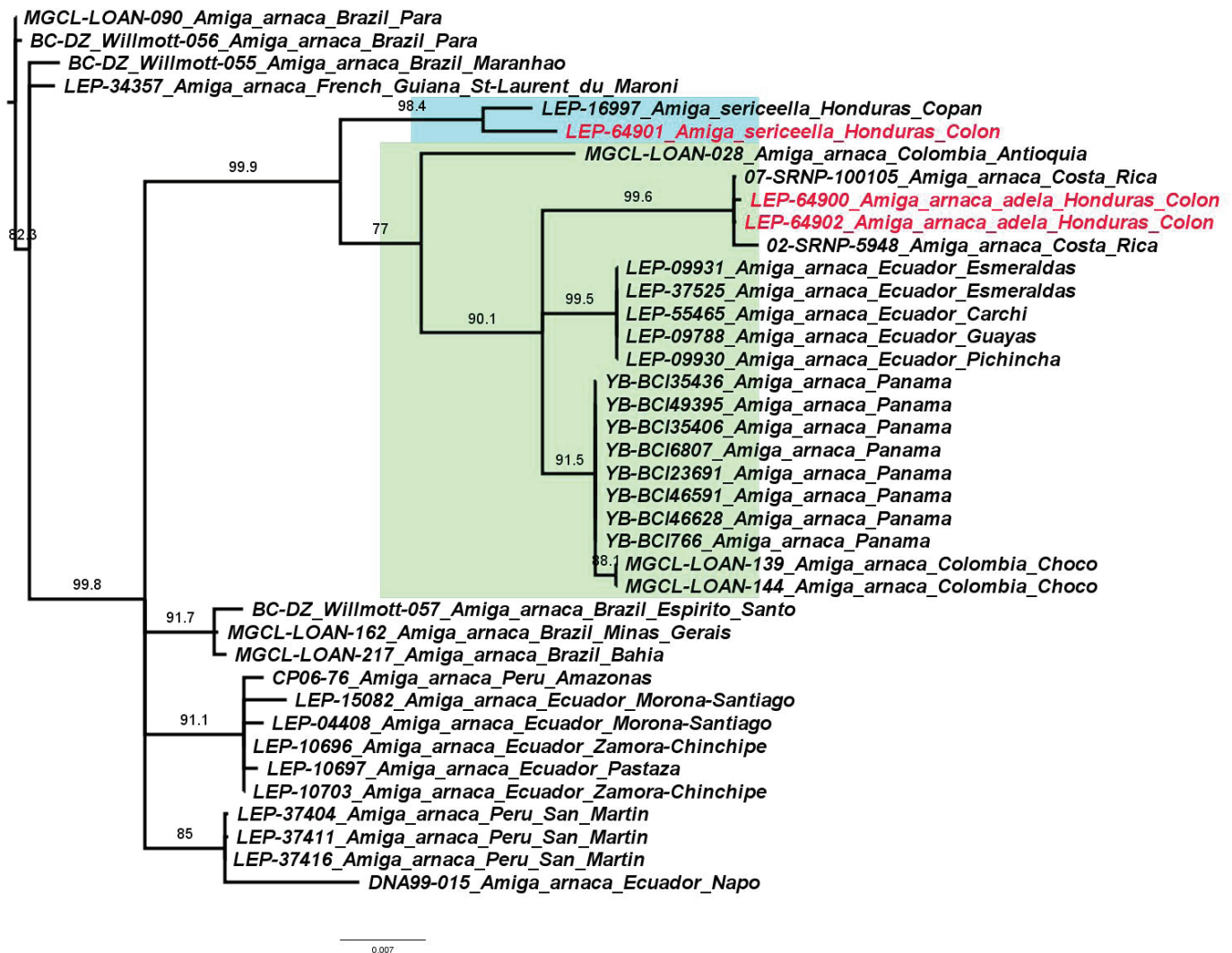


Figure 3. Neighbor-joining tree illustrating three newly sequenced, sympatric *Amiga* individuals (in red) grouping together with either *A. sericeella* stat. rev. or *A. arnaca adela* (Tamura-Nei employed as distance model; bootstrapping values as branch support).

an unrooted Neighbor-joining (NJ) tree, using Tamura-Nei as a distance model and 1,000 replications of bootstrapping as the re-sampling method, to graphically illustrate these three newly barcoded sequences belonging to *A. sericeella* and *A. arnaca adela* (Fig. 3). Despite missing 29 base pairs from position 399 to 427 in one previously sequenced *A. sericeella* (LEP-16997), the intra-specific distance (1.0 %) between the two “barcoded” *A. sericeella* is smaller than inter-specific distance (over 3.5 %) among other sampled *Amiga* individuals from Central and South America, presenting a distinct “barcoding gap”.

The reinstatement of *Amiga sericeella* results in the paraphyly of *A. arnaca*; however, given the lack of known areas of sympatry to support a specific status among other current *Amiga arnaca* subspecies, we prefer to keep the subspecific status of the three remaining *Amiga arnaca* subspecies until additional evidence becomes available to provide further insights into the status of *Amiga* taxa. As discussed in Nakahara *et al.* (2019b), paraphyletic butterfly species are widely accepted, such as the euptychiine species *Zischkaia mielkeorum* Dolibaina, Dias & Zacca, 2019 (see Nakahara *et al.*

2019b: Fig.1), even in very well studied butterfly groups such as *Heliconius* Kluk, 1780 (e.g., *H. erato* (Linnaeus, 1758) and *H. cydno* (Doubleday, 1847), see Kozak *et al.* (2015: Fig. 2)). Therefore, despite the genetic divergence between the nominate race and *A. arnaca adela* being greater than that between *A. sericeella* and *A. arnaca adela*, we consider sympatry to be a critical additional piece of evidence to reconsider the taxonomic status of *A. sericeella*. Consequently, we regard *Amiga* as including two species:

Amiga Nakahara, Willmott & Espeland, 2019
(– denotes a subspecies, – – denotes a synonym)

arnaca (Fabricius, 1776)
– – *ebusa* (Cramer, 1780)
– – *priamis* (D’Almeida, 1922)
– *adela* Nakahara & Espeland, 2019
– *indianacristoi* Nakahara & Marín, 2019
sericeella (Bates, 1865) stat. rev.

Examined Specimens (ROGA: Robert Gallardo collection, Las Vegas, Honduras):

Amiga arnaca adela (2 ♂, 2 ♀): Honduras: Colón: Río Platano Biosphere Reserve, [15.325986N 85.283229W], 1,000 ft. - 2,800 ft, (Gallardo, R.), 24 March 2019, 1 ♂ (ROGA), (Gallardo, R.), 25 March 2019, 1 ♀ (ROGA), (Gallardo, R.), 1 April 2019, 1 ♂, 1 ♀ (ROGA).

Amiga sericeella (2 ♂): Honduras: Colón: Río Platano Biosphere Reserve, [15.325986N 85.283229W], 1,000 ft. - 2,800 ft, (Gallardo, R.), 1 April 2019, 1 ♂ (ROGA), 23 March 2019, 1 ♂ (ROGA).

Due to an unfortunate oversight, Nakahara *et al.* (2019a) contains several errors regarding references, thus we also take this opportunity to provide *corrigenda* to that paper:

On p. 90, (Katoh 2013) should be changed to (Katoh and Standley 2013).

On p. 100, Lamas *et al.* 1999 should be changed to Lamas *et al.* 1991.

In addition, these references were omitted from the list of references (in the order they appear in the article):

Matos-Maraví, P. F., Peña, C., Willmott, K. R., Freitas, A. V. L., Wahlberg, N. 2013. Systematics and evolutionary history of butterflies in the “*Taygetis* clade” (Nymphalidae: Satyrinae: Euptychiina): towards a better understanding of Neotropical biogeography. *Molecular Phylogenetics and Evolution* 66: 54–68.

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