Description of two new species of the Neotropical genus *Yphthimoides* Forster, 1964 (Lepidoptera: Nymphalidae: Satyrinae) from the ‘*renata*’ clade

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This paper describes two new species of Neotropical butterflies: *Yphthimoides blanquita* Barbosa, Marin and Freitas sp. nov., from the dry forest of northwestern Colombia, and *Yphthimoides nareta* Barbosa & Freitas sp. nov. from northeastern Brazil, based on morphological and molecular data. Adult morphology, including wing shape and pattern as well as male genitalia, is described in detail. Furthermore, analysis of the mitochondrial Coxl ‘barcode’ showed that both new species are quite distinct from all similar *Yphthimoides* species and additionally, the ‘*renata*’ clade is defined based on the presence of cornuti in the aedeagus.

http://zoobank.org/urn:lsid:zoobank.org:pub:22CA85FF-9682-4016-A300-AB11C71CEDA2  

**Keywords:** integrative taxonomy; Satyrini; butterfly; biodiversity; molecular data; dry forest

### Introduction

In recent years, the study of biodiversity has become a recurrent and important theme[1–5] This is because the accelerated habitat loss caused by human actions [6–9] has resulted in a drastic decrease in species richness, which represents a substantial part of biodiversity.[10,11] This has led to the extinction of many species before they are formally described, directly affecting biodiversity measures [6,12–14] and resulting in the loss of important information for biodiversity conservation and management.[15,16]

Exacerbating the problem of quantifying and reducing the loss of biodiversity is the issue that several undescribed taxa may be hidden within morphologically similar species complexes, as is the case of many butterflies in the subfamily Satyrinae, particularly in the subtribe Euptychiina [17,18]. In addition, a number of Euptychiina genera are non-monophyletic,[17,19–21] even though their species may be similar in external appearance. Such is the case of *Yphthimoides* Forster, 1964, a relatively speciose Euptychiina genus whose species have been recently reorganized into at least three other Euptychiina genera, and for which six new species have been described in the last decade.[22–26]

The present paper describes two additional cryptic species of *Yphthimoides*, previously identified as *Y. renata*, based on an integrative taxonomic approach [27–29] using morphological and molecular data.

### Material and methods

**Morphology**

Adult dissections were made using standard techniques. Legs, palpi and abdomens were soaked in hot 10% KOH solution for 10 min before dissection, and dissected parts were stored in glycerol. Photographs of the male genitalia were taken using a Zeiss SteREO Discovery.V20 Stereomicroscope (Zeiss, Germany). Taxonomic nomenclature follows,[22] modified after [30] and [31]. The following abbreviations are used: (FW) forewing, (HW) hindwing, (D) dorsal and (V) ventral.

*Yphthimoides* specimens were examined in 10 public collections. The Lamas collection of Neotropical butterfly type specimen photographs at the MUSM (also available online in [32]) was examined, representing most of the currently relevant names and recognized species of *Yphthimoides* [22], except for *Y. acmenis* (Hübner, 1823), *Y. patricia* (Hayward, 1957), *Y. punctata* (Weymer, 1911) and *Y. renata* (Stoll, 1780). The last four species are all clearly illustrated (except for *Y. patricia*) and characterized in their original descriptions. It is noteworthy, however, that the genitalia of *Y. patricia* (EPB et al. in prep) is distinct such that there is no close relation with both new species described herein. Specimens of *Y. renata*, a taxon very similar to both new species described, including all taxa synonymized by Lamas [22], were studied from material obtained at several Brazilian localities in the states of Roraima, Maranhão, Mato Grosso do Sul,
Mato Grosso, Paraná, São Paulo, Minas Gerais, Bahia and Alagoas; as well as from Mexico, Colombia and Costa Rica (Guianacaste).

The acronyms for the collections examined are: DZUP – Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil; IML – Instituto Miguel Lillo, Tucumán, Tucumán, Argentina; MEFLG – Museo Entomológico Francisco Luis Gallego, Universidad Nacional de Colombia, Medellin, Colombia; MNHN – Muséum National d’Histoire Naturelle, Paris, France; MNRJ – Museu Nacional da Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; NHMUK – The Natural History Museum, London, England; ZSM – Zoologische Staatssammlung München, München, Germany; ZUEC – Museu de Zoologia da Universidade Estadual de Campinas, Campinas, São Paulo, Brazil; ZUEC-AVLF – André V. L. Freitas Collection, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil.

Genetic distance and relationship analysis
Genetic distances and the relationship between Yphthimoides species were estimated to evaluate the validity of new species placement in the genus Yphthimoides. Genomic DNA was extracted from two legs of each individual using the Invitrogen Spin Tissue Mini Kit protocol (Stratec Molecular, Berlin, Germany) and stored in TE buffer at –20 °C.

The barcode region of the mitochondrial gene Cytochrome C Oxidase I (CoxI ~658 bp) for all of examined specimens was amplified, purified and sequenced using standard techniques [33,34]. Sequences were analyzed with the program FinchTV v. 1.4.0 (Geospiza, PerkinElmer Inc., Waltham, MA), and posteriorly aligned using BioEdit v. 7.2.4 [35]. Sequences were analyzed with the program MEGA 6.0 program. Genetic distances among Yphthimoides species (Table 2) were determined using the program MEGA v. 6.0 [36] under Kimura-2-parameters (K2P) model of nucleotide substitution.

Taxonomy
Yphthimoides blanquita Barbosa, Marín and Freitas, sp. nov.

Diagnosis. Yphthimoides blanquita sp. nov. resembles some individuals of Y. renata from Brazil, but they are easily distinguished from the latter by the rounder wing (they are more angulate in Brazilian Y. renata), by the size of VHW ocelli (smaller in Y. renata) and by the lighter ground color of V wings (darker in Y. renata). The male genitalia shows no consistent differences between Y. blanquita sp. nov. and other closely related Yphthimoides species (namely Y. renata, Y. manasses (C. Felder & R. Felder, 1867), Y. ordinaria Freitas, Kaminski and Mielke, 2012 and Y. leguialimai (Dyar, 1913), see below).

Description
Male (Figure 1(A, B)). FW length: 22.0–23.8 mm (n = 2); HW length: 18.7–19.0 mm (n = 2). Eyes entirely naked and brown. Palpus length approximately 1.5 times the head width, beige, with long dark brown and short white hairs. Antenna 8.5–9.3 mm in length (n = 2) extending to mid-costa, with 39–40 antennomeres; shaft rust-brown; club with 10–11 antennomeres. Legs covered with short white hair and white cream scales. Ground color of D wings dark brown with few markings; a thin dark marginal line and a broader dark submarginal line following contours of wing margins. HW outer margin slightly wavy. DHW with two complete ocelli outlined by a yellow ring, with a middle black disk; first one larger with double white pupils in CuA1–CuA2, second one smaller with single white pupil in CuA2–2A. V wings mostly light brown. VFW with a dark brown zigzag submarginal line, and a brown regular marginal line extending from costa to 2A and crossed by two dark brown lines: first one slightly irregular, one-third from the wing base to the apex, extending from Sc to 2A; second one straight, at two-thirds from the wing base to the apex extending from R3 to 2A; one small complete ocellus in R2–M1. VHW with a thin dark brown zigzag submarginal line, and a brown slightly irregular marginal line following wing contours extending from costa to 2A and crossed by two regular dark brown lines: first one extending from costa to 2A, one-third from the wing base to the apex; second one at two-thirds from the wing base to the apex, extending from costa to anal margin and delimiting a broad light cream region that extends to the wing margin; a series of six complete ocelli outlined by a ring of yellow scales, black middle disk and with double white pupil in Rs–M1 (ocellus 1), M1–M2 (2), M2–M3 (3), M3–CuA1 (4), CuA1–CuA2 (5) and CuA2–2A (6); ocelli 1, 3 and 4 smaller than the others; ocelli 3 and 4 reduced to white pupils surrounded by yellow scales; ocelli 2 and 5 larger than others. No conspicuous androconial scales or patches observed.

Male genitalia (Figure 2(A–F)). Saccus short and triangular in D and V views (2B–C); tegumen rounded; gnathos long and pointed and half size of valva; uncus elongated and narrow in D view with a truncated apex;
valva elongated, trapezoidal and ending in a pointed apex in lateral view (2A); internal margin of valvae (cucullus, sensu [38]) with a series of very small teeth; aedeagus is straight in both D and lateral view (2E-F); cornuti present (2D); fultura inferior absent.

Female
(Figure 1C, D)). FW length: 21–25 mm (n = 5); HW length: 19–23 mm (n = 5). General color and pattern very similar to, but paler than that of males. Palpus length approximately one-third of antenna length.

Female genitalia. The few known females of Y. blanquita that are in the museum in Colombia are not available to be dissected. However, a forthcoming study about the ‘Y. renata species complex’ will further investigate female genitalia (Barbosa et al. in prep).

Remarks on color variation. In examined individuals (n = 15), variation on the D wing surfaces is practically absent, and obvious seasonal variation has not been observed. Variation in the V wing color pattern is minimal, and restricted to the size and shape of the ocelli.

Habitat. Yphthimoides blanquita sp. nov. is associated with dry and tropical forests at altitudes ranging from 200 to 1550 m, where it occurs at forest edges; in secondary disturbed forests and in fruit crop areas.

Table 1. Sequenced specimens of Yphthimoides with voucher code, sampling sites data and GenBank accession numbers for Coxl (~658 bp).

| Species name       | Voucher code | Locality                        | GenBank accession |
|--------------------|--------------|---------------------------------|-------------------|
| Yphthimoides angularis | YPH-0145    | Alfenas, Minas Gerais, Brazil   | KP994870          |
| Yphthimoides angularis | YPH-0417    | Ibiritê, Minas Gerais, Brazil   | KP994871          |
| Yphthimoides bella   | YPH-0337     | Pirenópolis, Goiás, Brazil      | KP994891          |
| Yphthimoides borasta | YPH-0103     | Jundiaí, São Paulo, Brazil      | KP994864          |
| Yphthimoides borasta | YPH-0162     | Jundiaí, São Paulo, Brazil      | KP980211          |
| Yphthimoides cipoensis | YPH-0333    | Santana do Riacho, Minas Gerais, Brazil | KP994865 |
| Yphthimoides gabriela | YPH-0250    | Santa Teresinha, Bahia, Brazil  | KP994882          |
| Yphthimoides gabriela | YPH-0255    | Santa Teresinha, Bahia, Brazil  | KP994883          |
| Yphthimoides iserhardi | YPH-0195    | Mucugê, Bahia, Brazil           | KP994886          |
| Yphthimoides iserhardi | YPH-0406    | Mucugê, Bahia, Brazil           | KP994887          |
| Yphthimoides lequialmai | CP08-88     | Ampay, Peru                      | GU205877          |
| Yphthimoides lequialmai | YPH-0595    | Machu Picchu, Peru               | KU525719          |
| Yphthimoides lequialmai | YPH-0598    | Machu Picchu, Peru               | KU525720          |
| Yphthimoides yphthima  | YPH-0209     | Santana do Riacho, Minas Gerais, Brazil | KP994867 |
| Yphthimoides yphthima  | CP12-03      | Santana do Riacho, Minas Gerais, Brazil | JQ797610 |
| Yphthimoides renata   | YPH-0035/BLU300 | Três Lagoas, Mato Grosso do Sul, Brazil | JX855932        |
| Yphthimoides renata   | YPH-0061     | Santa Rita do Passo Quatro, São Paulo, Brazil | KU525704        |
| Yphthimoides renata   | YPH-0092     | Mato Grosso, Brasil              | KU525714          |
| Yphthimoides renata   | YPH-0253     | Santa Teresinha, Bahia, Brazil  | KU525715          |
| Yphthimoides renata   | YPH-0287     | Pacaraima, Roraima, Brazil      | KU525716          |
| Yphthimoides renata   | YPH-0510     | Serra Grande, Alagoas, Brazil   | KU525717          |
| Yphthimoides renata   | YPH-0518     | São José de Ribamar, Maranhão, Brazil | KU525718        |
| Yphthimoides renata   | YPH-0330     | Cali, Colombia                   | KP994878          |
| Yphthimoides renata   | 07-SRNP-100018 | Guanacaste, Costa Rica            | JQ573906          |
| Yphthimoides renata   | MAL-04257    | Laguna Azul, Mexico              | GU658811          |
| Yphthimoides ochracea | YPH-0175     | São Francisco de Paula, Rio Grande do Sul, Brazil | KP994879 |
| Yphthimoides ochracea | YPH-0351     | São Francisco de Paula, Rio Grande do Sul, Brazil | KP994880 |
| Yphthimoides ordinaria | YPH-0411    | Foz do Iguacu, Parana, Brazil    | KP994877          |
| Yphthimoides ordinaria | Yph_sp       | Santa Bárbara, São Paulo, Brazil | JQ797600          |
| Yphthimoides manasses | YPH-0013     | Paulo Afonso, Bahia, Brazil      | KP994874          |
| Yphthimoides manasses | YPH-0192     | Mucugê, Bahia, Brazil            | KP994875          |
| Yphthimoides celsis   | YPH-0209     | Foz do Iguacu, Parana, Brazil    | KP994868          |
| Yphthimoides celmis   | YPH-0463     | Nboiqua, Paraguari, Paraguai    | KU525709          |
| Yphthimoides straminae | YPH-0015    | Minas Gerais, Brazil             | KU525703          |
| Yphthimoides straminea | YPH-0134    | Alfenas, Minas Gerais, Brazil    | KP994872          |
| Yphthimoides blanquita | YPH-0438    | Santa Fe de Antioquia, Antioquia, Colombia | KU525706 |
| Yphthimoides blanquita | YPH-0439    | Santa Fe de Antioquia, Antioquia, Colombia | KU525707 |
| Yphthimoides blanquita | YPH-0440    | Puerto Berrio, Antioquia, Colombia | KU525708 |
| Yphthimoides blanquita | YPH-0467    | Amalfí, Antioquia, Colombia      | KU525710          |
| Yphthimoides blanquita | BMC1901     | Anserma, Caldas, Colombia        | KU525712          |
| Yphthimoides blanquita | BMC1902     | Peque, Antioquia, Colombia       | KU525713          |
| Yphthimoides nareta   | YPH-0322     | Serra Grande, Alagoas, Brazil    | KU525705          |
| Yphthimoides nareta   | YPH-0508     | Serra Grande, Alagoas, Brazil    | KU525711          |
Table 2. Pairwise genetic distances of the COI gene among 16 *Yphthimoides* species.

| Species                  | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    | 12    | 13    | 14    | 15    | 16    |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| *Y. borasta* (2)         |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| *Y. angularis* (2)       | 0.072 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| *Y. cipoensis* (2)       | 0.059 | 0.067 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| *Y. iserhardi* (2)       | 0.059 | 0.066 | 0.043 |       |       |       |       |       |       |       |       |       |       |       |       |       |
| *Y. yphthima* (2)        | 0.076 | 0.065 | 0.064 | 0.071 |       |       |       |       |       |       |       |       |       |       |       |       |
| *Y. straminea* (2)       | 0.067 | 0.057 | 0.064 | 0.066 | 0.058 |       |       |       |       |       |       |       |       |       |       |       |
| *Y. renata* (BR) (7)     | 0.094 | 0.074 | 0.087 | 0.084 | 0.091 | 0.081 |       |       |       |       |       |       |       |       |       |       |
| *Y. ochracea* (2)        | 0.073 | 0.057 | 0.055 | 0.063 | 0.054 | 0.084 |       |       |       |       |       |       |       |       |       |       |
| *Y. celmis* (2)          | 0.065 | 0.052 | 0.047 | 0.050 | 0.047 | 0.046 | 0.081 | 0.051 |       |       |       |       |       |       |       |       |
| *Y. bella* (1)           | 0.074 | 0.057 | 0.076 | 0.070 | 0.069 | 0.058 | 0.076 | 0.062 | 0.047 |       |       |       |       |       |       |       |
| *Y. gabriela* (2)        | 0.070 | 0.050 | 0.059 | 0.061 | 0.069 | 0.076 | 0.076 | 0.044 | 0.057 | 0.057 |       |       |       |       |       |       |
| *Y. ordinaria* (2)       | 0.094 | 0.062 | 0.077 | 0.073 | 0.074 | 0.071 | 0.056 | 0.072 | 0.069 | 0.077 | 0.077 |       |       |       |       |       |
| *Y. manasses* (2)        | 0.091 | 0.069 | 0.086 | 0.081 | 0.090 | 0.081 | 0.065 | 0.084 | 0.072 | 0.077 | 0.081 | 0.046 |       |       |       |       |
| *Y. renata* (CA) (3)     | 0.093 | 0.076 | 0.093 | 0.092 | 0.092 | 0.084 | 0.070 | 0.084 | 0.071 | 0.080 | 0.090 | 0.073 | 0.059 |       |       |       |
| *Y. leguialimai* (3)     | 0.089 | 0.063 | 0.076 | 0.078 | 0.080 | 0.075 | 0.076 | 0.071 | 0.067 | 0.076 | 0.048 | 0.046 | 0.051 |       |       |       |
| *Y. blanquita* (6)       | 0.086 | 0.063 | 0.070 | 0.069 | 0.073 | 0.069 | 0.054 | 0.068 | 0.066 | 0.069 | 0.066 | 0.053 | 0.052 | 0.063 | 0.046 |       |
| *Y. naretas* (2)         | 0.087 | 0.072 | 0.080 | 0.083 | 0.081 | 0.074 | 0.066 | 0.086 | 0.070 | 0.083 | 0.075 | 0.050 | 0.060 | 0.066 | 0.046 | 0.053 |

Notes: Number in parenthesis is sample size.
BR means ‘Brazil’ and CA means ‘Central America and Colombia’. 
Distribution. Based on field observations and museum records, the species is present in northern Colombia in Andean foothills and in inter-Andean valleys and canyons (Figure 3), where it is sympatric with *Y. renata* from the Central American clade.

Etymology. The species name is dedicated to Dr Blanca Huertas, a prominent Colombian biologist and curator of the butterfly collection in the British Museum of Natural History (NHMUK), who has made a large contribution to the understanding of Satyrinae systematics. ‘Blanquita’ is the diminutive of ‘blanca’, and can be used as an affectionate nickname in Colombia.

Conservation. *Yphthimoides blanquita* sp. nov. is present in several different habitats, including forest edges and secondary environments, suggesting that it can tolerate a degree of disturbance. However, natural habitats where *Y. blanquita* sp. nov occurs, including the dry forests of northwest South America, have experienced a noteworthy decline in recent years and are among the most threatened Neotropical biomes, remaining strongly underrepresented even in protected areas.[39,40] Thus, additional ecological data will be required for an adequate evaluation of the conservation status of this species.

Type material

Holotype. Male (Figure 1(A, B)) with the following labels (four labels separated by inverted transverse bars) \HOLOTYPUS\HOLOTYPUS *Yphthimoides blanquita* Barbosa, Marin & Freitas det. 2015 MEFLG/Colombia, Antioquia, Amalfi, Porce – Normandia [Normandía], 6°47`15" 75°07`10" [6.7875; -75.1194]. 20 °C, 960 msnm. T. VSR (Pescado). En bosque. 26-Sep-1998. P. Duque leg. \Lepidoptera Nymphalidae Satyrinae Yphthimoides\ sp, Identificó: M.A. Marín Fecha: 2009-06-09, Número de catalogo: 15687

Allotype. (Figure 1(C, D)) with following labels (four labels separated by transverse bars): \ALLOTYPUS\ALLOTYPUS *Yphthimoides blanquita* Barbosa, Marin & Freitas det. 2015 DNA voucher – YPH0438 MEFLG \Colombia, Antioquia, Santa Fe de Antioquia [Santa Fe de Antioquia], Cotove [Cotové], 6°32`06"N 75°49`52"W [6.5350; -75.8311], 519 msnm. Jama 11/03/07 [11.III.2007], 11:00:00 Cultivo de Mango. Colector: M.A. Marín leg. gsm338-752\Lepidoptera Nymphalidae Satyrinae Yphthimoides\ sp, Identificó: M.A. Marín Fecha: 2009-06-09, Número de catalogo: 15692, 752 – gsm338

Paratypes (all from Colombia). ZUEC – Antioquia: Amálfí, Picardía, 1 male, 12.X.2007, DNA voucher
YPH0467 (genitalia prepared), M.A. Marín leg., ZUEC LEP 9666; MEFLG – Antioquia: Santa Fé de Antioquia, Cotove, 1 male, 21.IV.2009, 519 m.a.s.l., DNA voucher YPH0439 (genitalia prepared), gsm349, 6°32′06″N 75°49′52″W, M.A. Marín leg., Número de catalogo: 15694; Santa Fe de Antioquia, Cotove, 1 female, 11.III.2007, 519 m.a.s.l., gsm322, 6°32′06″N 75°49′52″W, A.M. Velez leg., Número de catalogo: 15693; Antioquia Puerto Berrio, HDA California, 1 female, 21.II.2013, DNA voucher YPH0440, BMC20142, M.A. Marín leg., Número de catalogo: 17528; Peque, 1 male, 29.IX.2009, DNA voucher YPH0558, BMC1902, 7°02′11.4″N 75°54′18.3″W, 1212 m.a.s.l., M.A. Marín leg., Número de catalogo: 26957; Amálfi, Picardia, 1 male, 14.VIII.1987, 1550 m.a.s.l., P. Duque leg., Número de catalogo: 15688; Amálfi, El Caiman, 1 female, 14.VIII.1997, 960 m.a.s.l., P. Duque leg., Número de catalogo: 15689; Amálfi, Porce, no abdomen, 14.VIII.1997, 960 m.a.s.l., P. Duque leg., Número de catalogo: 15691; Caldas: Anserma, El 41 – HDA Canos, 1 male, 26.IX.2010, DNA voucher YPH0559, BMC1901, 5°10′13.440″N 75°40′44.708″W, 810 m.a.s.l., C.E. Giraldo leg., Número de catalogo: 26956; Cordoba: Monteria, Tres Palmas, 1 female, 01.IX.1972, 30 m.a.s.l., 8°27′N 75°57′W, R. Velez leg., Número de catalogo: 8489.

*Yphthimoides nareta* Barbosa and Freitas, sp. nov.

Diagnosis. *Yphthimoides nareta* sp. nov. (Figure 4(A, B)) and *Y. renata* (Figure 4(C, D)) are very similar and almost indistinguishable based only on wing pattern. Two subtle differences are: (1) the mottled ground pattern on the VHW is yellowish in *Y. nareta* sp. nov. (it is grayish in *Y. renata*), and (2) a short dark line is present along part of the M2–M3 transverse vein in *Y. nareta* sp. nov. (this dark line is longer and more conspicuous, extending from M2–M3 to R sector, in *Y. renata*). As with *Y. blanquita* sp. nov., the male genitalia of *Y. nareta*
Figure 3. Map showing all recorded localities of *Yphthimoides blanquita* (based on all examined material).

Figure 4. Syntopic specimens of *Yphthimoides narveta* (Holotype), A – dorsal, B – ventral; and *Yphthimoides renata* (DNA voucher YPH0510). C – Dorsal, D – Ventral. Both from Alagoas, Brazil.
sp. nov. is apparently similar from that of the other closely related Yphthimoides species. The DNA barcode, however, was very effective to distinguish Y. nareta sp. nov. from Y. renata and from all other species of Yphthimoides.

Description

Male (Figure 4(A, B)). FW length: 22.0–22.5 mm (n = 2); HW length: 18.7–20.0 mm (n = 2). Eyes entirely naked and brown. Palpus length approximately 1.5 times the head width, beige, with long dark brown and short white hairs. Antenna of males 8.5–9.0 mm in length (n = 2) extending to mid-costa, with 39–40 antennomeres; shaft rust brown; club with 10–11 antennomeres. Legs covered by long dark and white hairs and creamy scales. Ground color of D wings dark brown with few markings; a thin dark marginal line and a broader dark submarginal line following contours of wing margins. HW outer margin slightly wavy. DHW with two complete ocelli outlined by a yellow ring, and black middle disk, first larger and with double with pupils in CuA1–CuA2, second smaller and with single pupil in CuA2–2A. V wings mostly light whitish brown; VFW crossed by two dark brown lines: first one slightly irregular, one-third from the wing base to the apex and extending from Sc to 2A; second one straight, at two-thirds from the wing base to the apex extending from R3 to 2A; a short dark line is present in the M2–M3 transverse vein; a dark brown zigzag submarginal line and a brown regular marginal line extending from costa to 2A; two small complete ocelli in M1–M2 (ocellus 1) and CuA1–CuA2 (2). VHW crossed by two regular dark brown lines: first one extending from costa to 2A, one-third distance from the wing base to the apex; second one at two-thirds from the wing base to the apex, extending from costa to anal margin; a thin dark brown zigzag submarginal line and a brown slightly regular marginal line following wing contours extending from costa to 2A; a series of six complete ocelli outlined by a ring of yellow scales, with a black middle disk and with double white pupils (exception being the ocellus number 6, with a single pupil) can be found in Rs–M1 (ocellus 1), M1–M2 (2), M2–M3 (3), M3–CuA1 (4), CuA1–CuA2 (5) and CuA2–2A (6); ocelli 1, 2, 5 and 6 larger than ocelli 3 and 4; ocelli 3 and 4 reduced to few white scales surrounded by some dark brown scales. No conspicuous androconial scales or patches observed.

Male genitalia (Figure 5(A–F)). Saccus short and triangular in D view (5B); tegumen rounded; gnathos long and pointed and half size of valva (5C); uncus elongated and narrow in D view with a slender constriction in the basal portion and a tapered apex; valva elongated, trapezoidal and ends in a pointed apex in lateral view (5A); internal margin of valvae (cucullus, sensu [38]) with a series of very small teeth; aedeagus straight in both D and lateral view (5E, 5F); cornuti present (5D); fultura inferior absent.

Female. No females are known for this species, but based on other related species females should be similar in appearance to males.

Remarks on color variation. Based on the two known individuals of Yphthimoides nareta sp. nov., wing color variation cannot be assessed, but ocelli 3 and 4 are strongly reduced in the holotype while are complete in the paratype.

Habitat. The two known individuals of Y. nareta sp. nov. were collected at the edge of wet submontane Atlantic Forest in Alagoas, at altitudes ranging from 300 to 400 m.

Distribution. This species is known only from the Usina Serra Grande, in the State of Alagoas in northeast Brazil, where it is sympatric with Y. renata from the Brazilian clade.

Etymology. The epithet nareta is an anagram with the name renata, since this new species has a high resemblance in wing color pattern to Yphthimoides renata and can be easily misidentifed with the latter.

Conservation. Yphthimoides nareta sp. nov. is known to be present only within remnants of the submontane Atlantic Forest in the Serra Grande region, Alagoas. Most of this region has been deforested, and the remaining habitats are under high anthropic pressure. However, without additional geographic data, no adequate evaluation of its conservation status can be made.

Type material

Holotype. Male (Figure 4(A–B)) with the following labels (five labels separated by inverted transverse bars): \(^1\)HOLOTYPE\Usina Serra Grande, Ibateguara\São José da Lage, Alagoas: Brazil – 400–450 m 18-XI-2012 Douglas H.A. Melo leg. \(^1\)Holotypus – Yphthimoides nareta Barbosa & Freitas det. 2015\DNA voucher – YPH0508 \ZUEC LEP 9667\.

Paratype. ZUEC – Alagoas: Usina Serra Grande, Ibateguara/São José da Lage, 1 male, 16.XII.2012, DNA voucher YPH0322 (genitalia prepared), Douglas H.A. Melo leg., ZUEC LEP 9668.

Molecular data

Genetic distances (Table 2). For Y. blanquita sp. nov. and Y. nareta sp. nov., pairwise intraspecific distances ranged from 0.0 to 0.8%. Interspecific distances ranged from 4.3 to 9.4%, overlapping with intraspecific distances of the range 4.5–8.5% between Y. renata specimens (Stoll, 1780) from Brazil, Colombia and Central America. Regarding the specimens identified as Y. renata, a possible complex of cryptic species is
involved in that case (EPB and AVLF in prep.) as can be seen by their relationships, forming two well distinct clades (Figure 6).

Neighbor-joining relationships (Figure 6). Based on sequences of the barcode region of the mitochondrial gene CoxI, both *Y. blanquita* sp. nov. and *Y. nareta* sp. nov. are monophyletic entities, well distinct from all other *Yphthimoides* species. The analysis recovered both species, with high bootstrap support, as belonging to the clade (hereafter ‘*Y. renata* species group’) that also includes *Y. manasses, Y. ordinaria, Y. leguialimai* and *Y. renata*. The supposedly common and widespread *Y. renata* appeared divided in two not closely related but well supported clades: (1) the ‘Brazilian clade’, including the specimens from Brazil, and (2) the ‘Central American clade’, including specimens from Mexico, Costa Rica and Colombia. It is worth noting that *Y. nareta* sp. nov. was quite distant from the syntopic specimen of *Y. renata* sampled in the present study (YPH-0510 in Figure 6), showing that it is not simply an isolated divergent population of the latter.

Discussion

The recently described taxa of Euptychiina can be roughly divided into two main groups: (1) butterflies that are quite distinct and easily recognized as new species or subspecies (e.g. [23,24,41–45]), and (2) cryptic species eventually distinguished by subtle external characters and/or morphology of genitalia (e.g. [20,25,46,47] this paper). The increasing use of molecular data such as the DNA barcodes has increased the identification of those in the second group (cryptic species), helping to uncover a high hidden biodiversity in Euptychiina. In the present study, this approach revealed two new species in a complex of at least four species (including the two clades of *Y. renata*) previously assumed as phenotypic variation of the common and widespread *Y. renata*. 
The ‘Yphthimoides renata species group’ is a well-supported clade by both molecular and morphological characters. All species in this clade have similar wing pattern (as previously discussed) and male genitalia, including the elongated valvae bearing very small teeth at the cucullus and the presence of cornuti in the aedeagus. The presence of cornuti in the aedeagus of all species in the ‘Yphthimoides renata species group’ is exclusive to this clade within the genus Yphthimoides (the reported lack of cornuti in Yphthimoides ordinaria...
by Freitas et al. [48] was a mistake, when in fact this species does have inconspicuous cornuti). Internal relationships within this clade, however, are still not resolved based on barcode data alone, but the presence of cornuti in this clade could be a synapomorphy based on its absence in the sister groups of Ypthimoides (EPB and AVLF, in prep.).

The present work is a good example of how molecular data can help the taxonomic study of insects by revealing new potential undescribed species embedded in the variation of widespread common species.

Author contributions

EPB and MAM did the morphological studies; EPB obtained the molecular data and was responsible for manuscript preparation. EPB, MAM and AVLF organized the data and the final version of the manuscript. All authors contributed in the form of discussions/suggestions and approved the final manuscript.

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