

A new genus, *Atlanteuptychia* gen. nov., for *Euptychia ernestina* (Lepidoptera: Nymphalidae: Satyrinae)

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ABSTRACT. *Atlanteuptychia* Freitas, Barbosa & Mielke, gen. nov. is proposed for *Euptychia ernestina* Weymer, 1911 and illustrated. This taxon lacks the posterior projection of the tegumen, a synapomorphy of *Euptychia* Hübner, 1818, and does not share morphological synapomorphies with *Cyllopsis* R. Felder, 1869 and *Paramacera* Butler, 1868, two Central American genera apparently closely related to *Euptychia ernestina*, based on molecular data. This evidence supports the proposition of a new genus endemic to the Atlantic Forest, *A. ernestina* stat. nov.

KEY WORDS. Atlantic Forest; butterfly; Euptychiina; Satyrini.

With over 400 described species, the subtribe Euptychiina (Nymphalidae: Satyrinae: Satyrini) is mostly Neotropical, with a single species in the Nearctic region and one in Southeast Asia (LAMAS 2004a, PEÑA *et al.* 2006, 2010, MARÍN *et al.* 2011). *Euptychia* Hübner, 1818, formerly including most Neotropical Euptychiina, now includes only 16 described species of small satyrines, typical of wet forests, predominantly in the Andean foothills and in the Amazon region (DEVRIES 1987, LAMAS 2004b, BRÉVIGNON 2005, PULIDO *et al.* 2011, FREITAS *et al.* 2012). Although its position within the Euptychiina is still unclear, *Euptychia* is a well-defined clade, supported by morphological and molecular data (PEÑA *et al.* 2006, 2010, PEÑA & WAHLBERG 2008, FREITAS *et al.* 2012).

Euptychia ernestina Weymer, 1911 was originally described in *Euptychia*, where it remained until recently, mainly because of its superficial resemblance to some *bona fide* *Euptychia* (WEYMER 1911). FREITAS *et al.* (2012), based on molecular and morphological evidence, suggested that this taxon should be removed from *Euptychia*. In particular, *E. ernestina* lacks the conspicuous posterior projection of the tegumen above the uncus, a synapomorphy of all known *Euptychia* (FREITAS *et al.* 2012). In fact, molecular data show not only that *E. ernestina* is not part of the *Euptychia* clade, but also that this taxon is part of a clade which includes the Central American *Cyllopsis* R. Felder, 1869 and *Paramacera* Butler, 1868 (PEÑA *et al.* 2006, 2010).

In this contribution we propose a new genus for *Euptychia ernestina* and provide a detailed morphological description of this species.

MATERIAL AND METHODS

Specimens of *E. ernestina* were studied and collected in the field in six localities in Southeastern Brazil: 1) Vale do Rio

Quilombo, Santos, São Paulo (23°48'S, 46°18'W, 50-200 m), 2) Morro Grande, Cotia, São Paulo (23°42'S, 46°59'W, 850-950 m), 3) Estação Biológica de Boracéia, Salesópolis, São Paulo (23°39'S, 45°53'W, 850 m), 4) DAE Dam, Serra do Japi, Jundiá, São Paulo (23°13'S, 46°58'W, 900-1200 m), 5) Grota Funda, Atibaia, São Paulo (23°10'S, 46°31'W, 1050-1100 m), and 6) Reserva Ecológica de Guapiaçu, Cachoeiras de Macacu, Rio de Janeiro (22°27'S, 42°46'W, 1000 m).

Additional data on *E. ernestina* deposited in museums were obtained from seven collections. The acronyms for the collections are: BMNH – The Natural History Museum, London, England; DZUP – Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil; DZUP-OM “Coleção Olaf H. H. Mielke”, Curitiba, Paraná, Brazil; MNRJ – Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil; MZSP – Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil; USNM – National Museum of Natural History, Smithsonian Institution, Washington, DC, USA; ZUEC – Museu de Zoologia da Universidade Estadual de Campinas, Unicamp, Campinas, São Paulo, Brazil. Additional data of sightings of the species in the field were kindly provided by Keith S. Brown Jr from several unpublished butterfly records.

Dissections were made using standard techniques. Legs, palp and abdomen were soaked in warm 10% potassium hydroxide for nearly 10 minutes before dissection. Dissected parts were stored in glycerol. In order to be able to see the venation, we soaked the wings in alcohol and NaClO solution (bleach) to dissolve the scales. The taxonomic nomenclature follows LAMAS (2004a), modified by PEÑA *et al.* (2006) and WAHLBERG *et al.* (2009). Drawings and measurements of wings, legs and palp were made using a Leica® MZ7.5 stere-

omicroscope equipped with a micrometric scale and a drawing tube. Photographs of the male and female genitalia were taken using a Zeiss Discovery V20 Stereomicroscope. The following abbreviations were used: (FW) forewing, (HW) hind wing, (D) dorsal, (V) ventral.

TAXONOMY

Atlanteuptychia Freitas, Barbosa & Mielke gen. nov.

Type species. *Euptychia ernestina* Weymer, 1911

Diagnosis. Eyes naked, dark brown with a light brown basal stripe. Palpus approximately 2.0 times longer than head height, covered with short, light yellow and long dark hairs (Fig. 3). Antenna 8.0-9.0 mm long, extending to mid-costa, with 29 to 32 segments; shaft dark brown with the internal margin bearing white dots; club composed of 10-11 segments, well developed, 3-4 of which are yellow in their middle section (Fig. 4). Legs covered with dark brown scales on femur and light yellow scales on tibia and tarsus.

Male genitalia (Figs 7-10): Saccus short; tegumen rounded; gnathos long and pointed, curved upwards; uncus elongated and pointed distally; valvae elongated, trapezoidal, with a pointed distal extremity, internal margin with a series of small teeth; aedeagus straight; cornuti absent; fultura inferior membranous.

Female genitalia (Figs 11-12): Papillae anales long and hairy, adorned with few setae, ductus bursae short and slightly sclerotized; corpus bursae ellipsoidal with two long sclerotized parallel signa running along the entire length of corpus bursae.

Etymology. The generic name refers in part to the Atlantic region of Brazil, to which the taxon is endemic, in addition to its relationship to other genera in Euptychiina.

Type and only species: *Atlanteuptychia ernestina* (Weymer, 1911), **comb. nov.**

Remarks. Among the genera with similar wing color patterns, *Atlanteuptychia* **gen. nov.** can be easily distinguished from *Euptychia* Hübner, 1818 by the absence of the posterior projection of the tegumen and by the presence of a well-developed gnathos in the male genitalia, and by the absence of a recurrent vein in the FW discal cell. The new genus differs from *Cissia* Doubleday, 1848 by the short saccus and gnathos (both usually longer in most *Cissia*); and from *Carminda* Dias, 1998 by the slightly wavy margin of the HW (strongly wavy in *Carminda*), and by the shape of the uncus in dorsal view (laterally extended in *Carminda*); differs from all species of the above three genera by the presence of a conspicuous androconial tuft of long hairs on the male HWD in space CuA_2-2A , and by having the last two abdominal segments dorsally covered with distinct black scales.

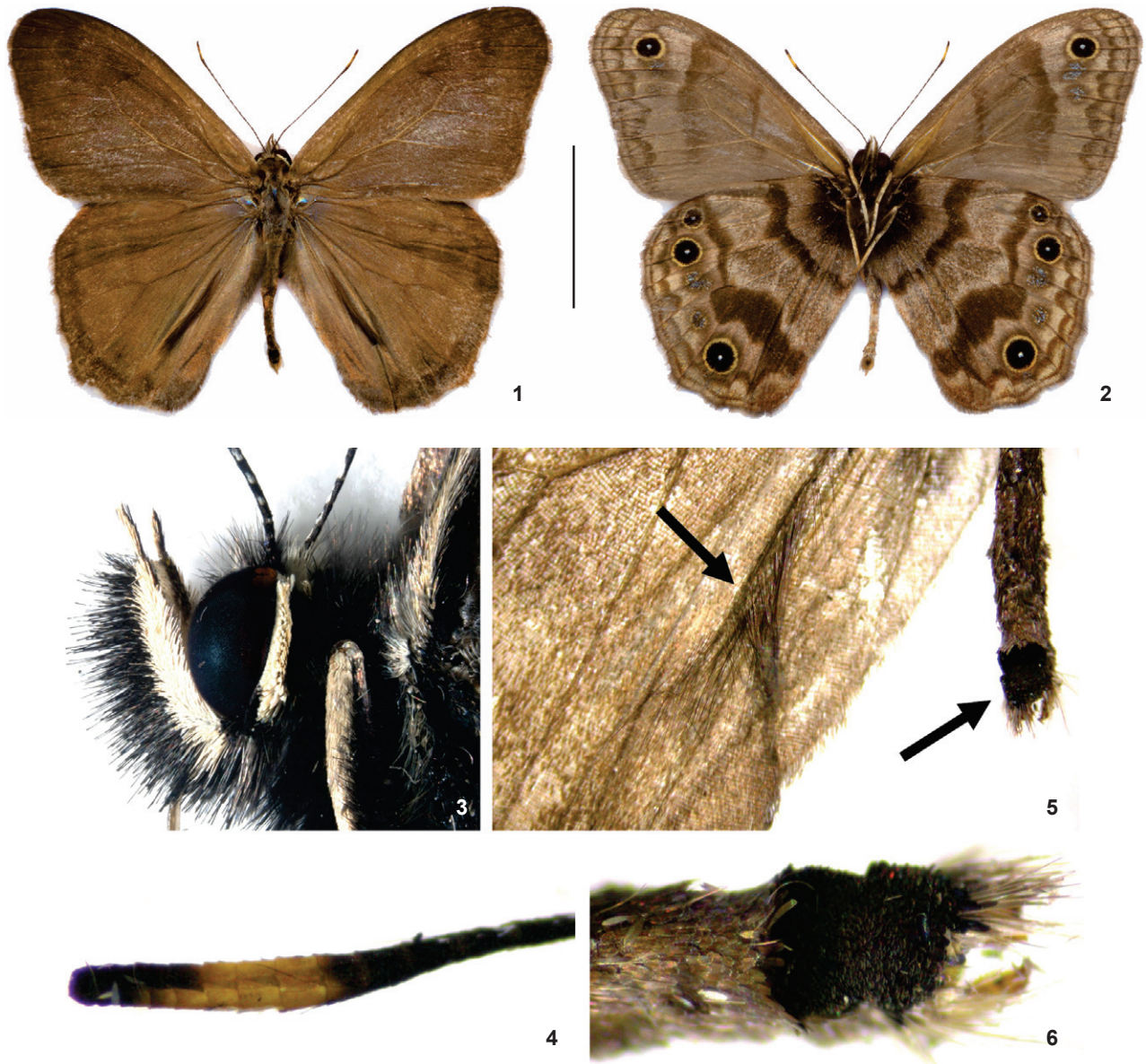
Atlanteuptychia ernestina comb. nov.

Figs 1-18

Euptychia ernestina Weymer, 1911: 206, pl. 47, lectotype female, [Santa] Leopoldina, Espir.[ito] Santo, Bras.[ilien], 1894. [Julius] Michaelis (deposited in Museum für Naturkunde, Humboldt Universität [MNHU], Berlin, Germany), herein designated by G. Lamas (examined in 1994); GAEDE 1931: 446; D'ABRERA 1988: 773, 874; BROWN & FREITAS 2000: 85, 104; LAMAS 2004b: 219; UEHARA-PRADO *et al.* 2004: 14, 24, pl. 9, 2007: 49, fig. 5 (code *Eern*); PEÑA *et al.* 2006: 35, 39, 40, 44, figs 1, 2, 6; PEÑA *et al.* 2010: 247, 250, 251, 252, 253, 254, figs 2, 3, 4; FRANCINI *et al.* 2011: 65; FREITAS *et al.* 2012: 466. The name *Euptychia ernestina* was established by WEYMER (1911) based on an unstated number of specimens from "Esperito [sic] Santo (Brasilien)". The lectotype has been designated to fix the identity of the name.

Redescription. Male (Figs 1-6). Body entirely dark brown. Last two abdominal segments dorsally covered with distinct black scales (Figs 5 and 6). FW length 16.0-19.0 mm ($n = 5$); HW length 15.0-16.0 mm ($n = 5$). Dorsal ground color of both wings brown with few markings; dark sub marginal stripe especially conspicuous in HW; well-defined androconia comprising long, dark hair-like scales in space CuA_2-2A on the HWD (Figs 1 and 5). Ventral color of both wings brown with several markings as following: FWV crossed by two weakly marked dark brown lines, first line extended from Sc, crossing discal cell to half the space CuA_2-2A one third from base; second line, broader, extended from costa to half the space CuA_2-2A two-thirds from the wing base; dark brown zigzagging sub marginal line and a brown regular marginal line extending from costa to 2A; apical region light, covered with cream scales, with well-developed dark ocellus in space R_5-M_1 complete, outlined by yellow ring, and with silver pupil; two to three additional irregular weakly marked silver ocelli without the black areas and with incomplete yellow outline apparent in most examined individuals are usually present in space M_1-M_2 and M_2-M_3 . HWV with dark brown region in basal area near insertion of wings; crossed by two dark brown irregular lines from costa to anal margin delimiting lighter area, first line more regular, one third from wing base; second lines irregular in shape and thickness, two-thirds from wing base; margin light brown, with dark brown irregular zigzag sub marginal line and brown regular marginal line extending from costa to 2A; series of five ocelli present in spaces $Rs-M_1$ (ocellus 1), M_1-M_2 (2), M_2-M_3 (3), M_3-CuA_1 (4), CuA_1-CuA_2 (5); ocelli 1, 2 and 5 complete, black, outlined by yellow ring, and with silver pupil; ocelli 3 and 4 irregular in shape, silver, without black areas and with incomplete yellow outline. Wing venation, palpus and foreleg of male are illustrated in Figs 13, 15, and 16, respectively.

Female. FW length 19.0 mm ($n = 2$). HW length 15.0-16.0 mm ($n = 2$). Except by the absence of patch of dark scales

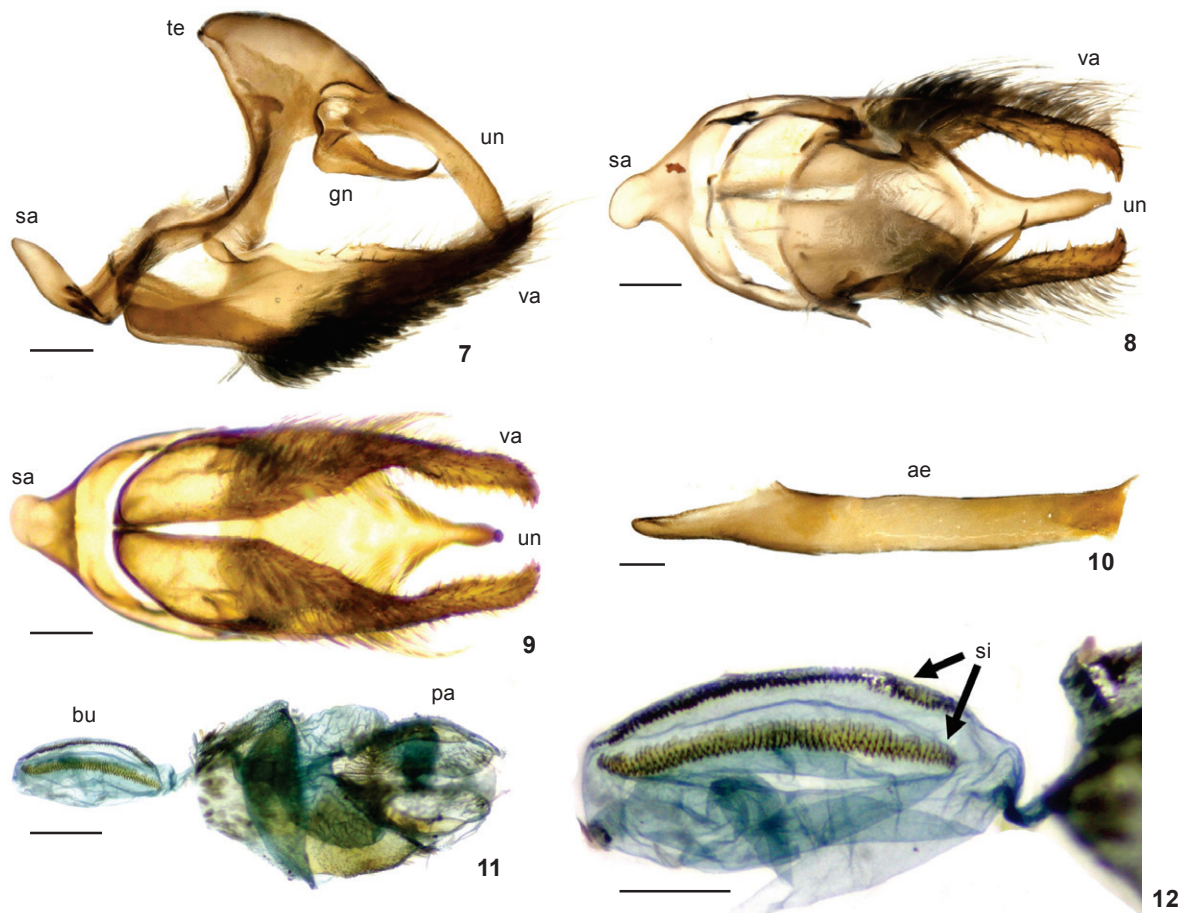


Figures 1-6. *Atlanteuptychia ernestina*. (1-2) Adult male: (1) dorsal side; (2) ventral side; (3-6) morphological characters: (3) eye and palpus details; (4) antenna club detail; (5) male hind wing androconial hairs (left arrow) and last abdominal segments with distinct black scales (right arrow); (6) detail of the distinct black scales covering dorsal portion of the last abdominal segments. Scale bar: 1-2 = 10 mm.

on apical abdominal segments, ground color and markings very similar to male, but most patterns paler and not well marked. Wing venation, palpus and foreleg of female illustrated in Figs 14, 17, and 18, respectively.

Color variation. All examined individuals are quite similar, and the few observed differences are in the size and conspicuity of the irregular silver ocelli of both wings, and the shape and width of the dark brown transverse bands in HWV.

Habitat and geographic distribution. Based on all available information, *A. ernestina* is widely distributed in 21 sites in the Brazilian states of Santa Catarina, Paraná, São Paulo, Rio de Janeiro, Minas Gerais and Espírito Santo, mostly from well preserved areas of wet forests in the Atlantic Forest Biome (see Table I and Fig. 19). The species is more common at 800 to 1100 m, but it is also present at the sea level on the foothills of coastal mountains in southeastern Brazil. Based on the present records, the species is considered rare, and has been seldom



Figures 7-12. Male and female genitalia of *Atlanteuptychia ernestina*: (7) male genitalia in lateral view; (8) male genitalia in dorsal view; (9) male genitalia in ventral view; (10) male eadeagus in lateral view; (11) female genitalia in ventral view; (12) female genitalia: detail of the *signa* in corpus bursae. (sa) Saccus, (te) tegumen, (un) uncus, (va) valva, (gn) gnathos, (ae) eadeagus, (bu) corpus bursae, (pa) papillae anales, (si) signa. Scale bars: 7-9 = 0.2 mm, 10 = 0.1 mm, 11 = 0.4 mm, 12 = 0.25 mm.

observed and/or collected. However, a recent study with baited traps (using banana and sugarcane juice fermented for 48 hours) in Serra do Japi (JPS and AVLF, unpub. data), suggests that it is more common than previously thought. In this locality, during 15 months of study, 12 adults were recorded (9 males and 3 females), 11 of which in the canopy, and only one in the understory. In previous fieldwork in the same site, only 4 individuals had been collected over 30 collecting days through 20 years (AVLF AND KEITH S. BROWN JR, unpub. data). These observations suggest that *A. ernestina* may be a canopy-dwelling species, and adults are collected on rare occasions when they descend to the understory. Females are usually collected when flying low in the understory, with a behavior that resembles host-plant searching, but additional observations are needed to confirm this. There is no additional information about behavior of either males or females, and host plants are unknown.

DISCUSSION

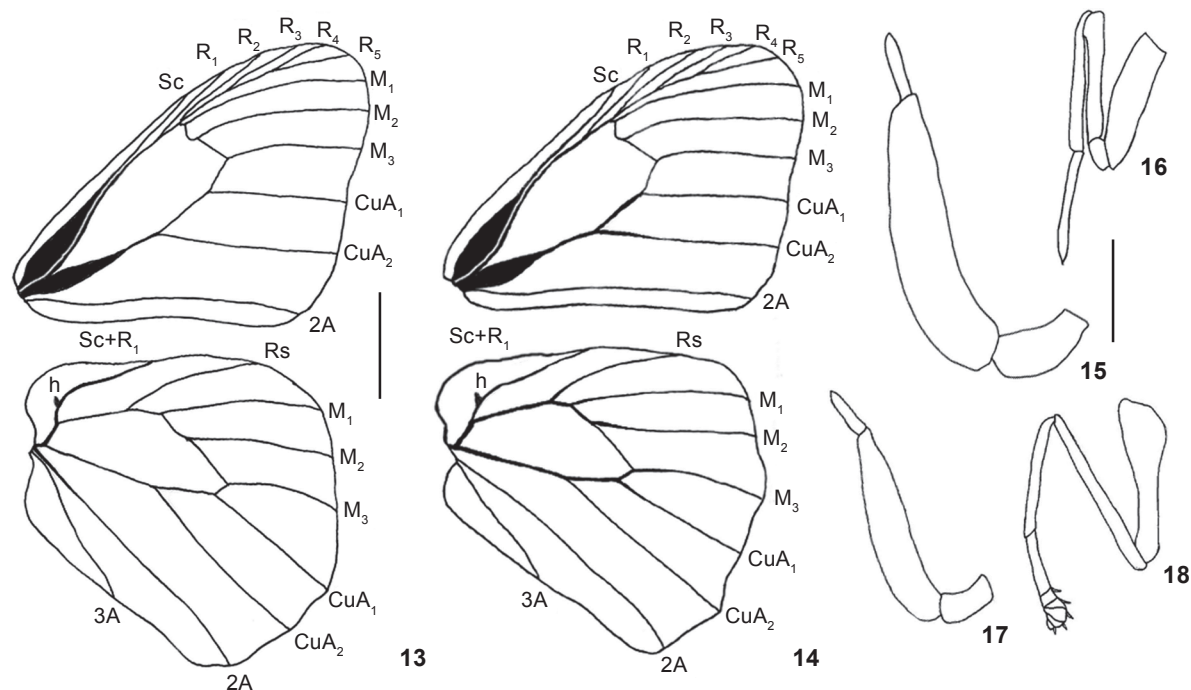
Although having a small wingspan and a wing pattern resembling that of some dark *Euptychia* (e.g., *Euptychia enyo* Butler, 1867, and *Euptychia picea* Butler, 1867), the removal of *A. ernestina* from *Euptychia* is supported by morphological (present study) and molecular data (PENA *et al.* 2010). The male genitalia lacks the posterior projection of the tegumen, a structure considered a synapomorphy of *Euptychia* (FREITAS *et al.* 2012). Additionally, *A. ernestina* differs from all known *Euptychia* by the presence of a well-developed gnathos in the male genitalia (absent in *Euptychia* spp.), and by the absence of a recurrent vein in the FW (present in *Euptychia* spp.) (FORSTER 1964, PULIDO *et al.* 2011, FREITAS *et al.* 2012).

Based on molecular data, *A. ernestina* is not related to any *Euptychia* species, but instead, it is the sister group of a clade

Table I. Data for studied individuals of *Euptychia ernestina* from seven Museum collections (see text for museum acronyms). KS Brown = unpublished record by Keith S. Brown Jr.

Acronyms	Sex	Date	State	Municipality	Site	Altitude (m)
BMNH	1 male	–	Rio de Janeiro	–	–	–
BMNH	1 female	–	Rio de Janeiro	–	–	–
BMNH	1 female	–	Espírito Santo	–	–	–
BMNH	1 female	VIII-IX.1884	Rio de Janeiro	Saquarema	“Laguna de Saquarema” ¹	50-100
DZUP	1 female	15.VIII.1953	Rio de Janeiro	Rio de Janeiro	Santa Teresa, Lagoinha ¹	250
DZUP	1 female	27.IV.1952	Rio de Janeiro	Rio de Janeiro	Paineiras	500
DZUP	1 male*	10.III.1963	São Paulo	Rio Claro ¹	–	600
DZUP	1 female*	10.III.1963	São Paulo	Rio Claro ¹	–	600
DZUP	1 male	11.IV.1971	Rio de Janeiro	Magé	Vila Inhomirim ²	50-200
DZUP	1 male	29.I.1968	Rio de Janeiro	Magé	Vila Inhomirim ²	50-200
DZUP	1 male	29.III.1969	Minas Gerais	Itaipé ¹	–	650
DZUP	1 female	29.IX.1918	Rio de Janeiro	Rio de Janeiro	Jacarepaguá, Três-Rios	10-100
DZUP	1 female	20.XII.1930	Rio de Janeiro	Engenheiro Paulo de Frontin	Fazenda Santa Bárbara	300-400
DZUP	1 female*	02.XI.1968	Rio de Janeiro	Itatiaia	Serra do Itatiaia/lado sul	1100
DZUP	1 female	10.X.1970	Paraná	Paranaguá	Alexandra	10
DZUP-OM	1 female	–	Rio de Janeiro	Rio de Janeiro	–	–
DZUP-OM	1 male	17.XI.1936	Rio de Janeiro	Petrópolis	Independência	1000
DZUP-OM	1 female	1.VIII.1983	Paraná	Paranaguá	Alexandra	10
MNRJ	1 male	VIII.19??	Rio de Janeiro	Rio de Janeiro	–	–
MNRJ	1 male	5.VII.1938	Rio de Janeiro	Rio de Janeiro	Gávea	10-50
MNRJ	1 male	IX.1924	Rio de Janeiro	Itatiaia	Parque Nacional Itatiaia	1000
MNRJ	1 male	–	Espírito Santo	Alegre	–	–
MZSP	1 male ²	14.VI.2010	São Paulo	Santo André	Parque do Pedroso	850
MZSP	1 female ²	12.I.2009	São Paulo	Santo André	Parque do Pedroso	850
MZSP	1 female	–	Santa Catarina	Anitápolis ¹	–	600
USNM	1 female	–	Rio de Janeiro	Petrópolis ¹	–	900
ZUEC	2 males	05.III.2011	Rio de Janeiro	Cachoeiras de Macacu	REG – Trilha Vermelha	1000
ZUEC	1 male ^{2*}	09.I.2012	São Paulo	Jundiáí	Serra do Japi	900-1100
ZUEC	1 female ^{2*}	10.XI.2011	São Paulo	Jundiáí	Serra do Japi	900-1100
ZUEC	2 males ²	08.IX.2012	São Paulo	Jundiáí	Serra do Japi	900-1100
ZUEC	2 males ^{2*}	11.XII.2012	São Paulo	Jundiáí	Serra do Japi	900-1100
ZUEC	1 male ²	07.IV.2002	São Paulo	Cotia	Morro Grande	850-950
ZUEC	1 female	20.V.1995	São Paulo	Santos	Vale do Rio Quilombo	50-100
ZUEC	1 female	III.1999	São Paulo	Atibaia	Grota Funda	1000
ZUEC	1 male ²	28.IX.2004	São Paulo	São Luis do Paraitinga	Votorantim	800
ZUEC	1 female ²	28.IX.2004	São Paulo	São Luis do Paraitinga	Votorantim	800
ZUEC	1 female ²	11.XI.2005	São Paulo	Salesópolis	EBB – Pilões	850
ZUEC	1 male ²	10.X.2011	São Paulo	Jundiáí	Serra do Japi	900-1100
K.S. Brown	1 male	28.VIII.1967	Rio de Janeiro	Rio de Janeiro	Morro do Sumaré	400-650
K.S. Brown	1 male	16.IX.1967	Rio de Janeiro	Rio de Janeiro	Morro do Sumaré	400-650
K.S. Brown	1 male	13.VIII.1969	Rio de Janeiro	Rio de Janeiro	Morro do Sumaré	400-650
K.S. Brown	1 female	28.IX.1968	Espírito Santo	Santa Teresa	Penha-Pasolini	750-850
K.S. Brown	1 male	4.V.1970	Espírito Santo	Santa Teresa	Penha-Pasolini	750-850

* Genitalia examined; ¹exact site of collecting unknown; ²specimens collected with baited traps.



Figures 13-18. Morphological characters of *Atlanteuptychia ernestina*: (13) male wing venation; (14) female wing venation; (15) male palpus; (16) male foreleg; (17) female palpus; (18) female foreleg. Scale bars: 13-14 = 5.0 mm, 15-18 = 1.5 mm.

composed by the two Central American genera, *Cyllopsis* R. Felder, 1869 + *Paramacera* Butler, 1868 (PEÑA *et al.* 2006, 2010). PEÑA *et al.* (2010) postulated that *Atlanteuptychia ernestina* has diverged from the ancestor of these two genera at approximately 26 mya.

Two characters of *Atlanteuptychia*, the conspicuous androconial tuft on the male HWD, and the distinct black scales on the abdomen, are both present in some *Chloreuptychia* Forster, 1964, namely *Chloreuptychia catharina* (Staudinger, [1886]), *Chloreuptychia hewitsonii* (Butler, 1867) and *Chloreuptychia tolumnia* (Cramer, 1777). However, in *Chloreuptychia* the androconial tuft is shorter and located in space 2A-3A, while in *A. ernestina* it is longer and located in space CuA₂-2A; the distinct patch of black scales is located in the mid-ventral abdomen in *Chloreuptychia*, whereas in *A. ernestina* it is located in the last two dorsal segments.

Based on morphology only, no other euptychiine genus shows clear affinities with *Atlanteuptychia*, including *Cyllopsis* and *Paramacera* (the two related genera based on molecular data, see above) (AVLF and M. A. MARÍN unpub. data). This is quite significant from a biogeographical perspective, especially concerning the wide disjunction of *Cyllopsis* + *Paramacera* with *Atlanteuptychia*; while the first two genera are distributed in Central and North America, *Atlanteuptychia* is endemic to the Atlantic Forest.

The proposal of the new genus, *Atlanteuptychia*, is supported by the absence of synapomorphies uniting *A. ernestina* with any other known Euptychiina, including the genera

Cyllopsis and *Paramacera* which were considered closely related in a recent molecular phylogenetic analysis (PEÑA *et al.* 2010).

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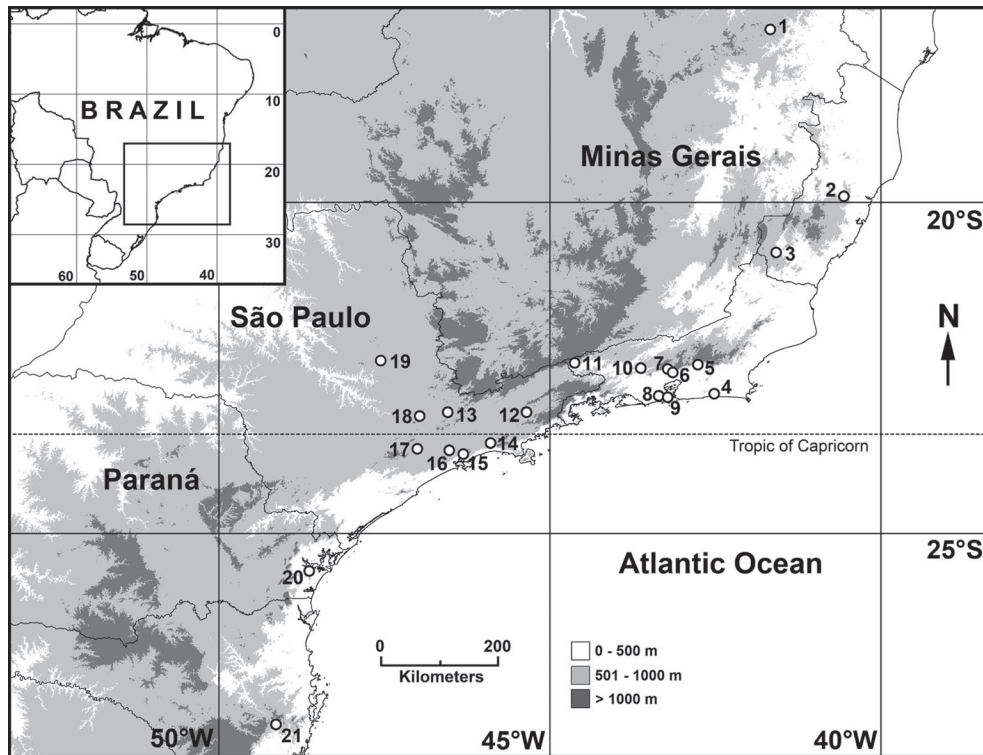


Figure 19. Map showing the 21 known localities for *Atlanteuptychia ernestina*: (1) Itaipé, MG; (2) Santa Teresa, including the region of Santa Leopoldina, ES; (3) Alegre, ES; (4) Saquarema, RJ; (5) Cachoeiras de Macacu, RJ; (6) Magé, RJ; (7) Petrópolis, RJ; (8) Jacarepaguá, RJ; (9) Sumaré, RJ; (10) Engenheiro Paulo de Frontin, RJ; (11) Itatiaia, RJ; (12) São Luiz do Paraitinga, SP; (13) Atibaia, SP; (14) Boracéia, SP; (15) Vale do Quilombo, SP; (16) Santo André, SP; (17) Cotia, SP; (18) Jundiá, SP; (19) Rio Claro, SP; (20) Alexandra, PR; (21) Anitápolis, SC. See Table I for further details of each locality.

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Appendix. The information below summarizes the current status and the systematics of *Euptychia* after the removal of *E. ernestina* (this information has been previously published with editorial errors by FREITAS *et al.* 2012).

Euptychia Hübner, 1818

Euptychia Hübner, 1818: 20. Type-species *Euptychia mollina* Hübner, 1818, designated by HEMMING (1937: 150).

Caenoptychia Le Cerf, 1919: 328. Type species *Caenoptychia bouletti* by original designation (synonymized by FREITAS *et al.* 2012).

Checklist of the described species and subspecies of *Euptychia* Hübner, 1818

- Euptychia bouletti* (Le Cerf, 1919)
- Euptychia cesarensis cesarensis* Pulido, Andrade, Peña & Lamas, 2011.
- Euptychia cesarensis viloriai* Andrade, Pulido, Peña & Lamas, 2011
- Euptychia enyo* Butler, 1867
- Euptychia fetna* Butler, 1870
- Euptychia hannemanni* Forster, 1964
- Euptychia hilara* (C. Felder & R. Felder, 1867)
- Euptychia insolata* Butler & H. Druce, 1872
- Euptychia jesia* Butler, 1869
- Euptychia marceli* Brévignon, 2005
- Euptychia meta* Weymer, 1911
- Euptychia mollina mollina* Hübner, 1818
- Euptychia mollina suzanna* Brévignon, 2005
- Euptychia neildi* Brévignon, 2005
- Euptychia picea* Butler, 1867
- Euptychia rubrofasciata* L.D. Miller & J.Y. Miller, 1988
- Euptychia rufocincta* Weymer, 1911
- Euptychia westwoodi westwoodi* Butler, 1867
- Euptychia westwoodi muli* Brévignon, 2005

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