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Two new species of *Actinote* (Lepidoptera, Nymphalidae) from Southeastern Brazil

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Abstract

Two new species of *Actinote* (Nymphalidae, Heliconiinae, Acraeini) are described from southeastern Brazil. *Actinote eberti* **sp. nov.** occurs in the Serra da Mantiqueira region and resembles members of the *Actinote* black-yellow mimicry group. *Actinote pratensis* **sp. nov.** is found in widely scattered points in the rich-soil central São Paulo transition between montane and semideciduous atlantic forest, and belongs to the orange-yellow mimicry group.

Key words: Acraeini, Atlantic Forest, butterfly, genitalia, Heliconiinae, Neotropics

> "And by the way, have you forgotten to say, where you live, what's your name, what you do."
> — Antonio Carlos Jobim

Introduction

Members of the heliconiine tribe Acraeini are characterized by distinctive morphology of the larvae, wing veins and scales, forelegs, and male and female abdomen and genitalia (Ehrlich 1958, Van Son 1963, Penz & Djunijanti 2003, Freitas & Brown 2004). The tribe currently includes *Pardopsis* Trimen, *Acraea* Fabricius, and *Actinote* Hübner. Phylogenetic studies suggest that *Actinote* constitutes a monophyletic subset of *Acraea* (Pierre 1987, Penz & Djunijanti 2003), hence the generic status of both *Acraea* and *Actinote* are questionable. Although *Actinote* is easily identifiable, there have been no attempts to pro-

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vide a clear morphological characterization of the genus other than the original description. Studies currently in progress will address this problem (M. Paluch *in prep*).

Due to the similarity among species, variation within species, and mimicry, *Actinote* butterflies are notoriously difficult to identify (*e.g.*, D'Almeida 1925, 1935; Francini 1989, 1992; Penz & Francini 1996). Furthermore, high elevation species are infrequently collected because they are typically univoltine, have a short flight period, and are highly localized (Francini 1989, 1992; Penz & Francini 1996). In sum, these factors explain why some *Actinote* species are known from a few worn specimens or have gone undetected.

The geologist and naturalist Heinz Ebert labeled nine *Actinote* specimens of his personal butterfly collection 'types' of a new species under the tentative name "itatiaia" after their collecting locality (mount Itatiaia, Rio de Janeiro, Brazil). Unfortunately, Ebert never published a formal description, and after his death his collection was transferred to Universidade Federal do Paraná, Brazil. Examination of the "itatiaia" specimens confirmed that they indeed represented an undescribed taxon, and here we describe this new species in honor of H. Ebert.

Depending on collection locality, adult body size, wing color pattern and condition, precise species identification of members of the *Actinote* orange-yellow mimicry group can be challenging. In our experience, mixed series frequently are identified as a single species in collections, and genitalic dissections often are required for correct identification of specimens. Knowledge of the early stages provides important information for species identification within the orange-yellow mimicry group because caterpillars of these species are distinguished from each other easily (Francini 1989). During a trip to Águas da Prata, São Paulo, Brazil, 3 November 1990, R. B. Francini and A. V. L. Freitas collected larval clusters of an unknown species of *Actinote*, which when reared yielded adults externally similar to *A. pyrrha* (Fabricius), but with distinctive male genitalia. This species was also recorded (due to its very distinctive larvae) in Serra do Japi (Jundiai, State of São Paulo) in February 1999**,** and in Mata da Santa Genebra (Campinas, State of São Paulo) in April 1999. Here we name this species after the locality where the first samples were collected.

These two new species are described here so they can be included in a key to southeastern Brazilian *Actinote* (R. B. Francini & C. M. Penz *in prep*.). A detailed study of the biology of *A. pratensis* will be presented elsewhere (R. B. Francini & A. V. L. Freitas *in prep*.).

Actinote eberti Francini, Freitas & Penz, sp. nov. (Fig. 1)

TYPE MATERIAL. Holotype: Adult male (Fig. 1B, C), Parque Nacional do Itatiaia, 1400 m, Itatiaia, Rio de Janeiro, southeastern Brazil, Heinz Ebert, 5 November 1962. Deposited in the collection of the Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil (collection reference number: DZ 3807). Holotype labels

(three labels, separated by transverse bars): Coleção H. Ebert / 421 paratype (hand written in red by H. Ebert) / Serra do Itatiaia, (R. J.), Süd – Seite, 1000–1200 m (crossed out), 1400m, 5-XI-1962, H. Ebert.

Paratypes**:** Seven adult males (collection reference numbers: DZ 2969 (genitalia prepared by R. B. Francini in 1989), 3805, 3806, 3809, 3810, 3811, 3812) and one adult female (DZ 3813), same data as holotype. One male, 1700 m, Campos do Jordão, São Paulo, Southeastern Brazil, Gagarin leg. 2 December 1927 (DZ 3808). All paratypes are in the collection of the Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil (UFPC).

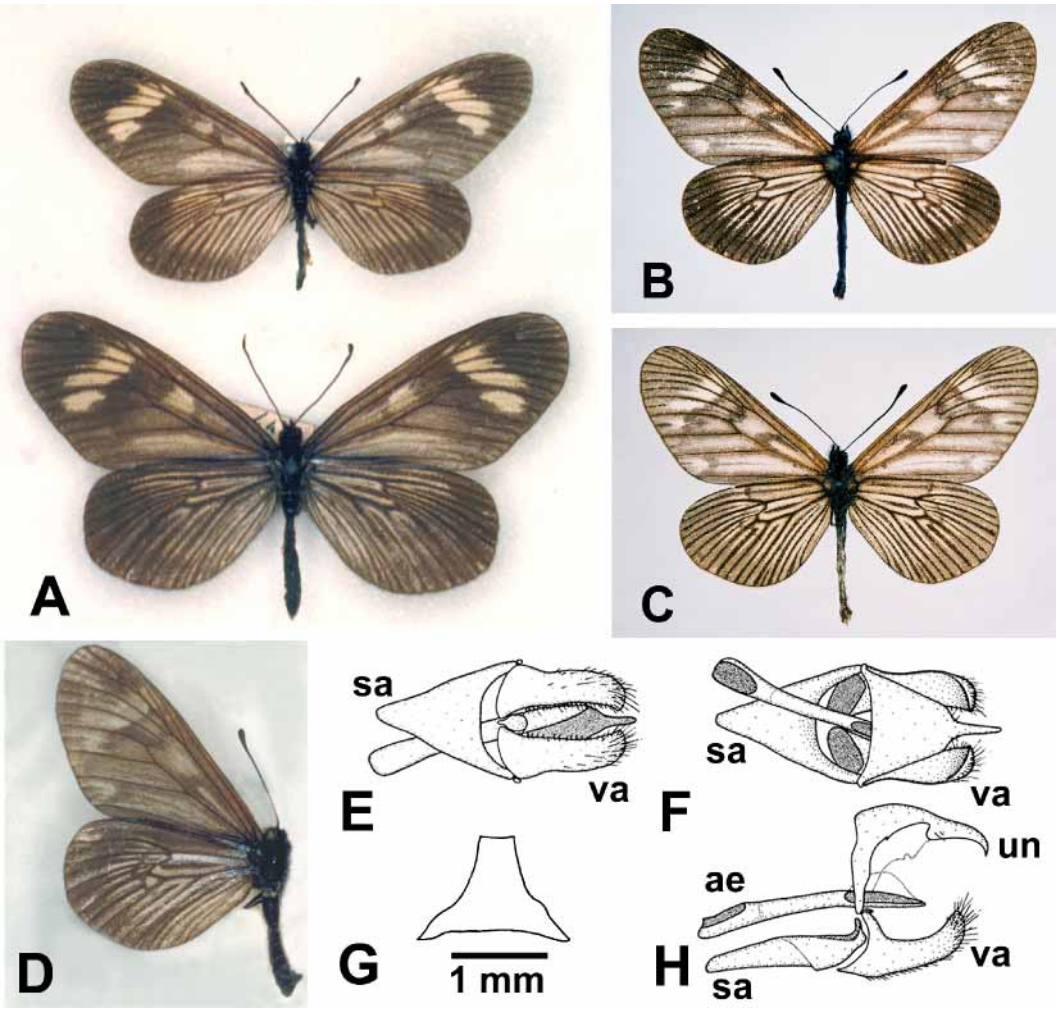

FIGURE 1. *A. eberti*; **A**, two males showing variation in wing size; **B**, holotype, dorsal view; **C**, holotype, ventral view; **D**, female, dorsal view; **E–H**, male genitalia (**E, F, H,** DZ 2969; **G**, DZ 3805); **E**, ventral view; **F**, dorsal view; **G**, 8th sternum (posterior edge up); **H**, lateral view; sa = saccus, va = valva, ae = aedeagus, un = uncus.

Diagnosis. The wing color and pattern are intermediate between the darker *A. morio* Oberthür and *zikani* D'Almeida (iridescent-black mimicry group; Francini 1989) and the more colorful *A. melanisans* (Oberthür) and *rhodope* D'Almeida (among other species in the black-yellow mimicry group). The wings have a greasy aspect, and the forewing is translucent, with colored areas faint but noticeable. The hindwing black margin is broad. Males can be easily distinguished from other species by the dorsoventrally bowed valva, broad tegumen, and small, anteriorly pointed juxta. Based on available specimens, female wings seem slightly darker than those of males. The sphragis is vertically attached to abdomen.

Description. Male (Fig. 1, A, B, dorsal; C, ventral; E–H, genitalia). Antenna black, extending to mid-costa. Forewing narrow and elongated, length 27–31 mm (mean = 28.8 mm, SD = 1.79, n=5); hindwing rounded, about two-thirds the length of forewing. Body dark brown, abdomen ventrally covered by cream scales. Forewing background color black, basal region translucent as a result of lower scale density. Discal cell with two dirty white markings, basal stripe thin and reaching about half the length of discal cell, distal spot broad and reaching end of discal cell. Cell Cu_2 with a whitish sheen for nearly its entire extension. A distal transverse yellow stripe (about 3–4 mm wide) crosses distal third of wing, from R_1 to Cu_1. Hindwing not translucent. Background black, central area covered by cream yellowish scales. Dark margin broad, extended from coastal to anal areas, not evident on ventral surface. A "v" shaped mark crossing the medial area between the margin and discal cell in some individuals. Scales in humeral area yellowish cream. Ventral surface of wings with the same pattern but lighter than dorsal surface.

Male genitalia (Fig. 1 E–H). Valvae elongate, length five times the width of the median portion; broader at base; in ventral view, there with slight constriction at about one-third of valva length; bowed dorsoventrally; apex with a short point. In dorsal view, basal portion of uncus wide, abruptly narrowing, ending in a point. Tegumen long and broad, trapeze-shaped. Gnathos absent. In ventral view, saccus shaped as an isosceles triangle, about half the length of the genitalic capsule. Aedeagus shorter than the length of genitalic capsule, ending in a sharp point, in lateral view slightly bowed ventrally. Juxta with an anterior point; narrow, about one-fourth the width of the base of one valva (in ventral view).

Female (Fig. 1D). General color and pattern similar to that of males. Sphragis vertically attached to the abdomen resulting in a conspicuous protuberance. We did not dissect the genitalia of the single female available. Studies in progress (R. B. Francini *unpublished* and M. Paluch *in prep.*) will provide this information.

Distribution and flight period. Based on the ten individuals known, the species occurs in Itatiaia and Campos do Jordão, and the flight period appears to be November and December. Because Itatiaia and Campos do Jordão are part of a continuous mountain range, this species is likely to occur in adjacent sites to the north or south of the type locality (e.g., Piquete and Queluz, São Paulo).

Etymology. The species is dedicated to Dr. Heinz Ebert (1907–1982), a geologist and indefatigable field entomologist who contributed greatly to our knowledge of systematics and biogeography of Brazilian butterflies.

Biology. The early stages and host plant are unknown, but based on known records for other *Actinote* species from the Brazilian Mata Atlântica (Francini 1989, 1992; Brown & Francini 1990; Brown 1992; Penz & Francini 1996), this species probably feeds on Asteraceae. Color pattern of museum specimens corresponds to some extent to the "black-yellow mimicry group" (*A. melanisans* and similar species) (R. B. Francini & C. M. Penz *in prep.*), but field observations of live individuals are needed to confirm this tentative assessment.

Actinote pratensis Francini, Freitas & Penz, sp. nov. (Fig. 2)

TYPE MATERIAL. Holotype: Adult male ex-larva (Fig. 2A, B), Bosque Municipal de Águas da Prata, Águas da Prata, São Paulo, Brazil, reared by R. B. Francini and A. V. L. Freitas, larvae collected 3 November 1990. Deposited in the collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP) (collection reference number RBF 8727). Holotype labels (four labels, separated by transverse bars): MORIO-SP, F2302, L-1017, n°10 / RBF 008727 / Bosque Municipal de Águas da Prata, Águas da Prata, São Paulo, Brazil, 03/NOV/1990 – ex larva / HOLÓTIPO.

Allotype: Adult female, ex-larva (Fig. 2C, D) same locality data as holotype, deposited in MZUSP (collection reference number RBF 8871). Allotype labels (four labels, separated by transverse bars): MORIO-SP, F2302, L-1017, n°21 / RBF 008871 / Bosque Municipal de Águas da Prata, Águas da Prata, São Paulo, Brazil, 03/NOV/1990 – ex larva / ALÓTIPO.

Paratypes: Two males (collection reference numbers: RBF 8931, 9107), ex-larva, MZUSP; two males (collection reference numbers: RBF 9170, 9230), ex-larva, Museu de História Natural, Unicamp (ZUEC); 14 females (collection reference numbers: RBF 8704, 8822, 8845, 8929, 8934, 9041, 9044, 9058, 9068, 9082, 9121, 9126, 9179, 9198), ex-larva, MZUSP; three females (collection reference numbers: RBF 8959, 9136, 9140), ex-larva, ZUEC; all same data as holotype. One male and one female, Mata da Santa Genebra, Campinas, State of São Paulo, reared by A. V. L. Freitas, larvae collected on August/1999, AVLF collection. Four males and one female, Rio Claro, São Paulo, Brazil, 17.IV.1963, H. Ebert leg (collection reference numbers DZ 6058, DZ 6550, DZ 6534, DZ 6074, DZ 6502), UFPC.

Diagnosis. The new species is smilar to *A. pyrrha* (Fabricius) and *A. carycina* Jordan but can be distinguished by the following combination of characters. In general male *pratensis* are larger than those of *pyrrha* and *carycina*, although the range in forewing length overlaps; the basal markings of the forewing are orange, and those in cells Cu_1 and Cu_2 are

usually diffuse at the edges; the sub-apical forewing markings are dirty white, usually ranging from R_5 to Cu_1; and the PD spot is absent. The dark border of the hindwing is generally broader in *pratensis* than in *pyrrha*, but the ranges of variation in this character overlap between these two species. Male valva are bowed, nearly homogeneous in width in lateral view, with a blunt apex. The aedeagus is shorter than the length of the genitalic capsule and comparatively thicker than those of *A. pyrrha* and *A. carycina*. The female wings are translucent at the base and slightly lighter than those of males, with the forewing orange color sometimes replaced by dirty white. The sphragis is vertically attached to abdomen.

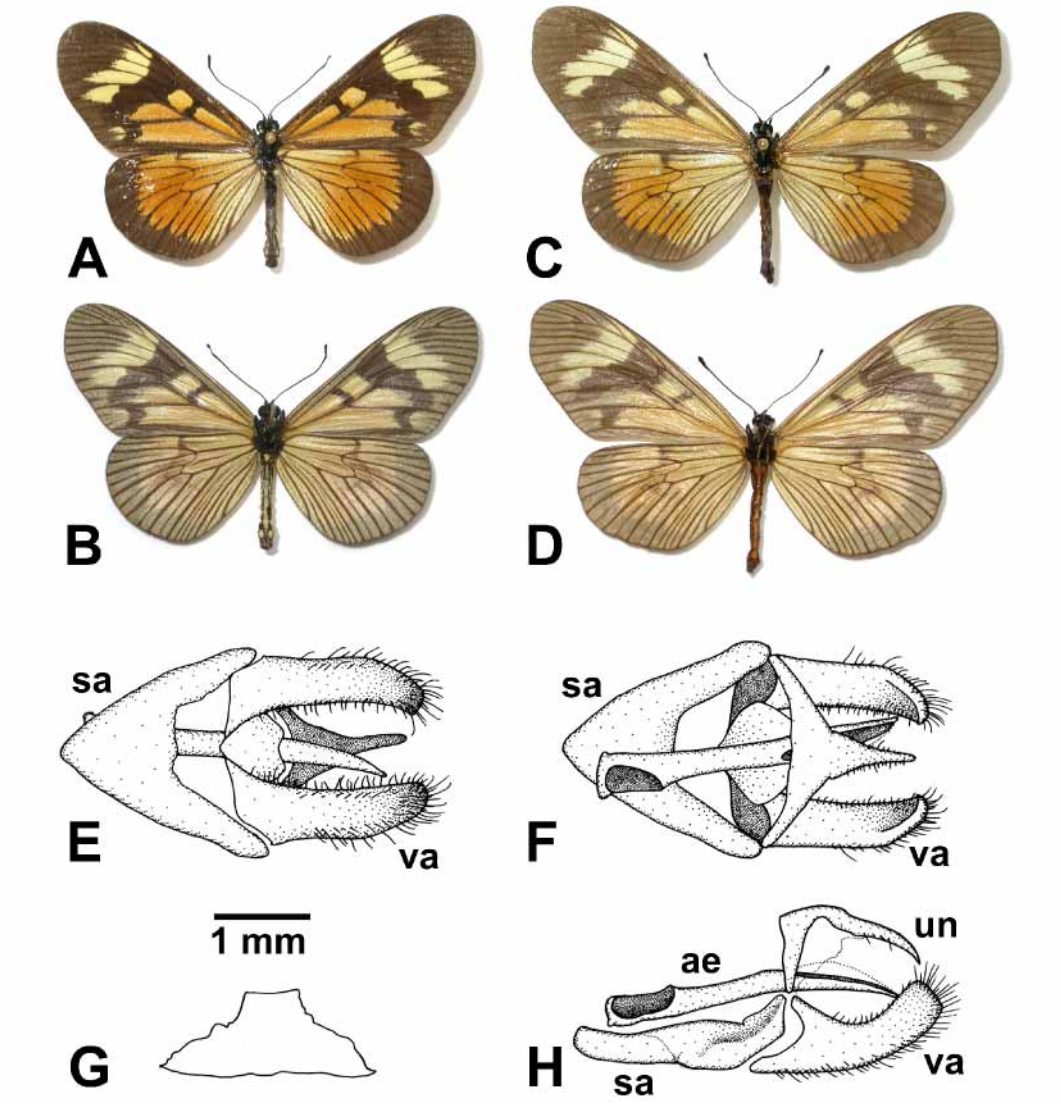

FIGURE 2. *A. pratensis*; **A**, holotype, dorsal view; **B**, holotype, ventral view; **C**, allotype, dorsal view; **D**, allotype, ventral view; **E–H**, male genitalia (RBF 9170) **E**, ventral view; **F**, dorsal view; **G**, 8th sternum (posterior edge up); **H**, lateral view. Codes follow Figure 1.

Description. **Male**. (Fig. 2 A, dorsal; B, ventral; E–H, genitalia). Antenna black, extending to mid-costa. Forewing narrow and elongate, length 25–32 mm (mean = 30 mm; SD = 2.0; n = 11); hindwing rounded, about two-thirds the length of forewing. Body black, abdomen ventrally covered by cream scales with a central black line, dorsolateral cream spots starting from first abdominal segment; lateral membrane covered with cream scales. Forewing upper surface background black, not translucent. Discal cell with two orange markings, basal stripe broad, reaching about half the length of discal cell, distal marking broad, reaching end of discal cell. Cells Cu_1 and Cu_2 with well developed orange markings usually diffuse at edges. Black dot near the basal area of cell Cu_2 ("PD" dot of Francini 1992: 32) absent in all known individuals. A sub-apical transverse dirty white stripe (about 3–4 mm wide) crosses the distal third of the wing, from R_5 to Cu_1. Hindwing not translucent. Background black, central area covered by orange scales. Dark margin occupying ca. one-fourth of wing surface, extended from coastal to anal areas. Hindwing "v" shaped mark weak, discontinuous or absent. Scales in humeral area orange. Ventral surface of wings with same pattern, but lighter than dorsal surface.

Male genitalia (Fig. 2 E–H): Valvae elongate, length four times width of median portion; broader at base; bowed and only slightly compressed dorsoventrally; nearly homogeneous in diameter in lateral view; apex blunt. In dorsal view, uncus gradually narrowing to a point. Tegumen short. Gnathos absent. In ventral view, saccus shaped as an isosceles triangle, about half the length of genitalic capsule. Aedeagus shorter than length of genitalic capsule, ending in a sharp point, in lateral view slightly bowed ventrally. Juxta broad, approaching the width of the base of one valva (in ventral view).

Female (Fig. 2C, D). Similar to male**,** but paler (in some individuals the orange of forewing completely replaced by dirty white). Base of forewings slightly translucent. Sphragis vertically attached to abdomen, similar to that of *A. pyrrha*.

Distribution and flight period. Populations of *A. pratensis* were recorded in four sites in São Paulo State**:** Águas da Prata, Rio Claro, Campinas**,** and Jundiaí. This species is bivoltine as are most species of *Actinote* from SE Brazil (Francini 1989), with adults flying in April and November.

Etymology. The name of this species is a Latinized version of 'pratense', the Portuguese word that denotes resident**s** of Águas da Prata, where the first population of *A. pratensis* was found.

Biology. Eggs are laid in clusters on the underside of *Eupatorium* sp. leaves (Asteraceae). Mature larva are dull green and have long body scoli (at least twice the width of the epicranium). Both these characteristics are distinctive from other known *Actinote* caterpillars. A full account of the early stages of *A. pratensis* is in preparation (R. B. Francini & A. V. L. Freitas *in prep.*).

Discussion

During the past 50 years mount Itatiaia, Rio de Janeiro has been extensively sampled for butterflies (e.g., by R. F. D'Almeida, H. Ebert, J. F. Zikán, O. Mielke and others). Hence it is surprising that we found only ten specimens of *A. eberti* in collections. Ebert left no notes on adult behavior or larval biology of *A. eberti*, and we know of no other collectors who have sampled this species at Itatiaia. As is the case in some other montane southeastern Brazilian *Actinote* (Francini 1992; Penz & Francini 1996), *A. eberti* appears to be rare and local. Therefore we suspect that unknown *Actinote* species remain to be found, particularly in higher altitude habitats.

While *A. eberti* went unrecognized because of its narrow geographical distribution, *A. pratensis* is much more widespread but was confused with other species, especially *A. pyrrha*. Once larval biology and morphology became known, *A. pratensis* was recorded from two of the most intensively studied areas in central São Paulo (Mata da Santa Genebra, Campinas and Serra do Japi, Jundiaí), where it went undetected during decades of field work. Our field experience with both these butterflies and their host plants suggests that *A. pratensis* could be present from southern Minas Gerais to central São Paulo.

Identification of *Actinote* butterflies is a challenge to most entomologists, and the females of some species are particularly difficult to determine (D'Almeida 1958; Francini 1989, 1992; Penz & Francini 1996; Paluch *et al.* 2003). After 25 years of rearing most of the known species of *Actinote* from Southeastern Brazil, it has become increasingly obvious that the caterpillars are sufficiently distinct to permit positive identifications to the species-level (Francini 1989, 1992, and unpublished). This is the case with *A. pratensis*, and we note here that all designated types are ex-larva to ensure positive identification of the adult specimens. Based on our experience, we also suspect that caterpillars of *A. eberti* will show characters unique to this species. Finally, we note that due to human impact in the Serra da Mantiqueira region, including Itatiaia and Campos do Jordão, and following the criteria defined in IUCN (2001) (the criteria used to define the list of Brazilian endangered species, MMA 2003), *A. eberti* can be considered at least a "vulnerable" species, requiring additional studies for defining its current conservation status.

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