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REVIEW OF THE GENUS *ITHOMISA* OBERTHÜR, WITH DESCRIPTION OF A NEW SPECIES FROM SOUTHEASTERN BRAZIL (LEPIDOPTERA: SATURNIIDAE, HEMILEUCINAE, HEMILEUCINI)

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Review of the genus *Ithomisa* Oberthür, with description of a new species from southeastern Brazil (Lepidoptera: Saturniidae, Hemileucinae, Hemileucini)

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ABSTRACT

A review of the genus *Ithomisa* Oberthür, 1881 is presented, recognising five species, including a new species, *Ithomisa caparao* **sp. nov.**, from Minas Gerais, southeastern Brazil. A neotype is designated for *Ithomisa umbrata* Oiticica-Filho, 1958, and updated distributional and morphological data are provided for all species. The study highlights the taxonomic difficulties within the genus resulting from low interspecific variation and limited material, while reinforcing the underestimated diversity of Neotropical Hemileucinae and the importance of continued surveys in the Atlantic Forest biome.

Keywords: Distribution, morphology, moths, Neotropical, neotype, taxonomy.

INTRODUCTION

The genus *Ithomisa* Oberthür, 1881 currently comprises four valid species distributed throughout southern and southeastern Brazil, Paraguay, Uruguay, and northeastern Argentina (Lemaire 2002). Species of the genus are large-sized moths characterised by subtle interspecific variation, a condition that has historically complicated their taxonomic delimitation (Oiticica-Filho 1958, Lemaire 2002). Although relatively uncommon in collections, perhaps because males are diurnal, representatives of the genus are associated with natural grasslands and wetlands within the Atlantic Forest and Pampa biomes, where they exhibit localised distributions and geographically structured phenotypes. Aspects of its biology, including the immature stages and host plants in the families Apiaceae and Eriocaulaceae, have been documented (Zikán 1927; Bourquin 1944; D'Araújo e Silva 1968; Pastrana 2004).

In his revision of the Hemileucinae, Lemaire (2002) reviewed the genus and discussed its apparent affinities with the genus *Eudyaria* Grote, 1896, emphasising similarities in wing morphology and male genital structures, following the characters proposed by Michener (1952). Despite these observations, the internal diversity of *Ithomisa* remains insufficiently understood, largely due to the scarcity of examined material and the limited geographic coverage of previous studies. Recent collecting efforts in southeastern and southern Brazil have revealed considerable variation within the group, particularly among populations associated with montane and submontane Atlantic Forest habitats.

In the present contribution, a new species of *Ithomisa* from southeastern Brazil is described based on external morphology, expanding the known diversity of the genus and contributing to a better understanding of its morphological variation and distributional patterns. Additionally, updated

distributional data for the remaining species of the genus are provided, and a neotype is designated for *Ithomisa umbrata* Oiticica-Filho, 1958. The discovery of a new species highlights the still underestimated diversity of Neotropical Hemileucinae and reinforces the importance of continued taxonomic surveys in the Atlantic Forest biome, one of the world's most threatened biodiversity hotspots (Myers *et al*. 2000).

MATERIAL AND METHODS

The distal third of the abdomen and genitalia were removed and macerated in a heated, under boil solution of 10% potassium hydroxide for about 10 minutes. The abdominal integument was opened through a right lateral cut, and then the genitalia were removed and stained with violet gentian. Dissections were preserved in microvials with glycerol and stored alongside the specimens. Images of adults were made with a Panasonic digital camera DMC-FZ250. The same camera was used for the genitalia, fitted with a Raynox Macroscopic Ring Lens Model M-250. All images were edited using Gimp 2.8, particularly for genitalia photographs, in which contrast was enhanced to compensate for overexposure.

Terminology for the genital structures follows Lemaire (2002) and Kristensen (2003). The labels of all name-bearing types are given verbatim and separated by forward slashes.

Codes enclosed in brackets (GB: GenBank, https://www.ncbi.nlm.nih.gov/genbank/; SI: ProcessID, https://v4.boldsystems.org/) following some specimens in the examined material list refer to COI (cytochrome c oxidase I) sequences.

Countries and states/provinces are given in bold, municipalities in italics, followed by districts and/or regional names.

Abbreviations

CEIOC	Entomological Collection of the Oswaldo Cruz Institute, Rio de Janeiro, Rio de Janeiro, Brazil
CGCM	Coll. Carlos G. C. Mielke, Curitiba, Paraná, Brazil
CJC	Coll. John Ciseski, Steven Points, WI, USA
CLB	Coll. Leonardo Bonatto, Caxias do Sul, Rio Grande do Sul, Brazil
CSNB	Coll. Stefan Naumann, Berlin, Germany
CTD	Coll. Thibaud Decaëns, Montpellier, France
DZUP	Coll. Padre Jesus S. Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil
MZSP	Museu de Zoologia da Universidade de São Paulo, São Paulo, São Paulo, Brazil
NHMUK	Natural History Museum, London, UK (formerly British Museum (Natural History))
USNM	National Museum of Natural History, Washington, DC, USA

Further abbreviations: FW – Forewing; HT – Holotype, LT – Lectotype, NT – Neotype, PT – Paratype; BsAs – Buenos Aires Province, MG – Minas Gerais, SC – Santa Catarina, RJ – Rio de Janeiro state.

TAXONOMIC ACCOUNT

Ithomisa Oberthür, 1881

Type species: *Ithomisa kinkelini* Oberthür, 1881, by monotypy.

Ithomisa Oberthür (1881: 114). – Draudt (1930: 784). – Oiticica-Filho (1958: 4). – Fletcher & Nye (1982: 84). – Lemaire (2002: 921). – Albertoni *et al*. (2018: 2828).

Dirphia (*Ithomisa*): Michener (1952: 469).

Species composition. Primary type, type-depository, and type-locality (country and state):

Ithomisa caparao C. Mielke & Koike, **sp. nov.**	HT ♂	DZUP	Brazil (MG)
Ithomisa catherina (Schaus, 1896)	LT ♂	USNM	Brazil (SC)
Ithomisa kinkelini Oberthür, 1881	LT ♂	NHMUK	Argentina (BsAs)
Ithomisa lepta (Druce, 1890)	LT ♀	NHMUK	Paraguay
Ithomisa umbrata Oiticica-Filho, 1958	NT ♂	DZUP	Brazil (RJ)

Remarks. As noted by Oiticica-Filho (1958) and Lemaire (2002), species of *Ithomisa* exhibit a remarkably conserved morphology, particularly in structures such as the antennae, legs, abdominal segments, and male genitalia (see Pl. 14). This overall uniformity has historically complicated the taxonomic delimitation of the group, since reliable diagnostic characters are largely restricted to differences in wing pattern and ornamentation, which may be subtle and variable among populations. Despite the low external variation, species appear to occupy relatively distinct geographic and ecological contexts, especially in natural grassland formations associated with the Atlantic Forest domain. Another factor affecting wing ornamentation is the tendency of males to lose scales while flying itself or while flying through and rubbing against surrounding vegetation (Oberthür 1881, May *et al*. 2014). This wear frequently results in an apparent narrowing of the black marginal band and partial descaling, particularly in the median area of both wings, potentially obscuring diagnostic colour patterns and increasing the difficulty of species identification (Pl. 7: Figs. 1 (fresh)-2 (flown)).

Biological information for the genus remains scarce, although some species are associated with herbaceous habitats whose larvae have been recorded feeding on plants of the genera *Eryngium* (Apiaceae) (*e.g.*, Bourquin 1944, D'Araújo e Silva 1968, Pastrana 2004) and *Actinocephalus polyanthus* (Eriocaulaceae) (Zikán 1927). These host associations suggest a close relationship between *Ithomisa* and open vegetation environments such as grasslands, including those up to nearly 3,000 m a.s.l.

Ithomisa caparao C. Mielke & Koike, sp. nov.

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Pl. 1: Figs. 1a-4b, Pl. 2: Figs. 1a-2b, Pl. 9: Figs. 1a-b, Pl. 14: Figs. 1a-2d

Holotype ♂ with the following labels (separated by forward slashes): BRAZIL – Minas Gerais (MG), Espera Feliz, nr. Pedra Menina (ES), Casa Queimada, 2.500 m. 26.I.2026, 20°27'45.72"S, 41°48'24.59"W, R. Koike leg./ 54.703 Col. C. Mielke/ HOLOTYPUS, *Ithomisa caparao* C. Mielke & Koike det. 2026/; DZUP.

Paratypes (in total 22 ♂, 1 ♀). **Brazil**. **Minas Gerais**. *Espera Feliz*: 4 ♂ 1 ♀, same data as HT (CGCM 32.266, 32.347, 54.501, 54.558, 54.652; 2 ♂ CGCM, 2 ♂ 1 ♀ DZUP); 2 ♂, same locality as HT, 2450 m: 21-25.I.1997, C. Mielke & E. Joerke leg. (CGCM 32.545, 33.128; CGCM); 1 ♂, same locality as HT (barcode SNB 6421 [SI: SASNC4303-19]; CSNB); 10 ♂, same locality as HT (1 ♂ CJC, 2 ♂ CTD, 7 ♂ CSNB). **Espírito Santo**. [*Dores do Rio Preto*], Parque Nacional Caparaó, Casa Queimada, 2.230 m, 20°29'44"S, 41°48'30"W: 5 ♂, 4-5.III.2017, M. Savaris leg. (DZUP).

Diagnosis. Males of *I. caparao* **sp. nov.** are similar to *I. umbrata* in their general brown wing ground colour and to darker specimens of *I. catherina*. However, the new species differs from all the other congeners by i) a more rounded forewing and ii) the fultura inferior is distinctly sclerotised (Pl. 14: Figs. 1c, 2c, 3c, 4c; arrows). Females of *I. caparao* **sp. nov.** have a uniform grey ground colour (Pl. 9: Fig. 1a), whereas females of the remaining congeners with a uniform ground

colour, such as *I. umbrata*, are brown (Pl. 9: Fig. 2a), and have a more rounded forewing as the male.

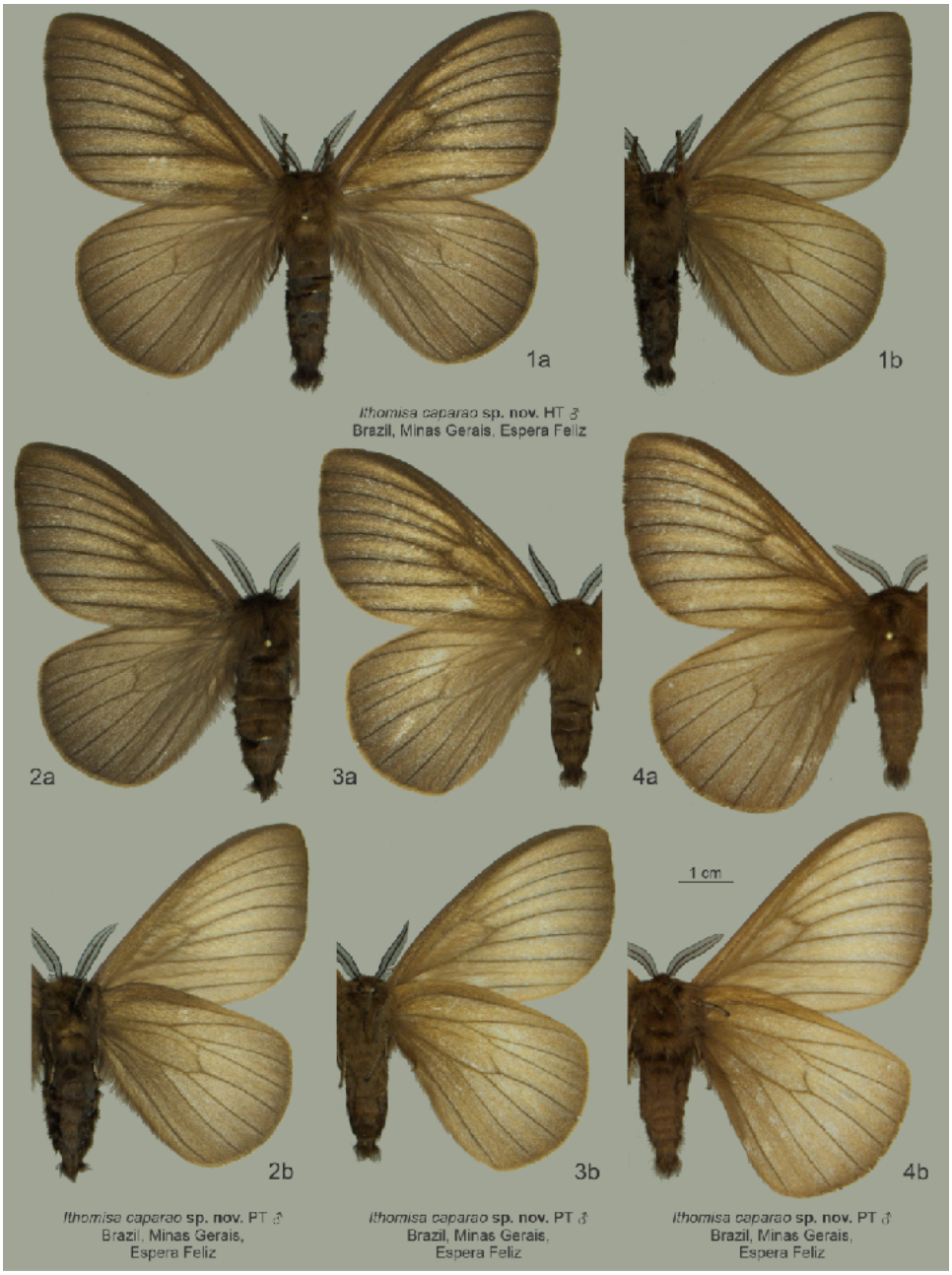

Plate 1, Figures 1–4. *Ithomisa caparao* **sp. nov.**: 1a (dorsal), 1b (ventral) (CGCM 54.703); 2a (dorsal), 2b (ventral) (CGCM 54.558); 3a (dorsal), 3b (ventral) (CGCM 54.501); 4a (dorsal), 4b (ventral) (CGCM 32.347). Depository: 1–3 (DZUP), 4 (CGCM).

Description. Male (Pl. 1: Figs. 1a-4b, Pl. 2: 1a-2b). FW length: 48-54 mm; wingspan: 87-94 mm.

Sternite VIII and male genitalia (Pl. 14: Figs. 1a-2d). Sternite VIII with lateral edges converging or not posteriorly; posterior margin produced on each side with a spiniform projection. Uncus simple, downcurved, distally sharped. Median plate of transtilla narrow, densely sclerotised; lateral arms projected posteriorly. Valves fused to tegumen and transtilla; ventrally lobate, projected posteriorly. Fultura inferior partially or entirely sclerotised, connecting both saccular lobes. Phallus with bulbus ejaculatorius and vesica 1/5 and 1/4 as long as sclerotised shaft, the latter armed with one spiniform cornutus.

Female (Pl. 9: 1a-1b). FW length: 57 mm; wingspan: 96 mm.

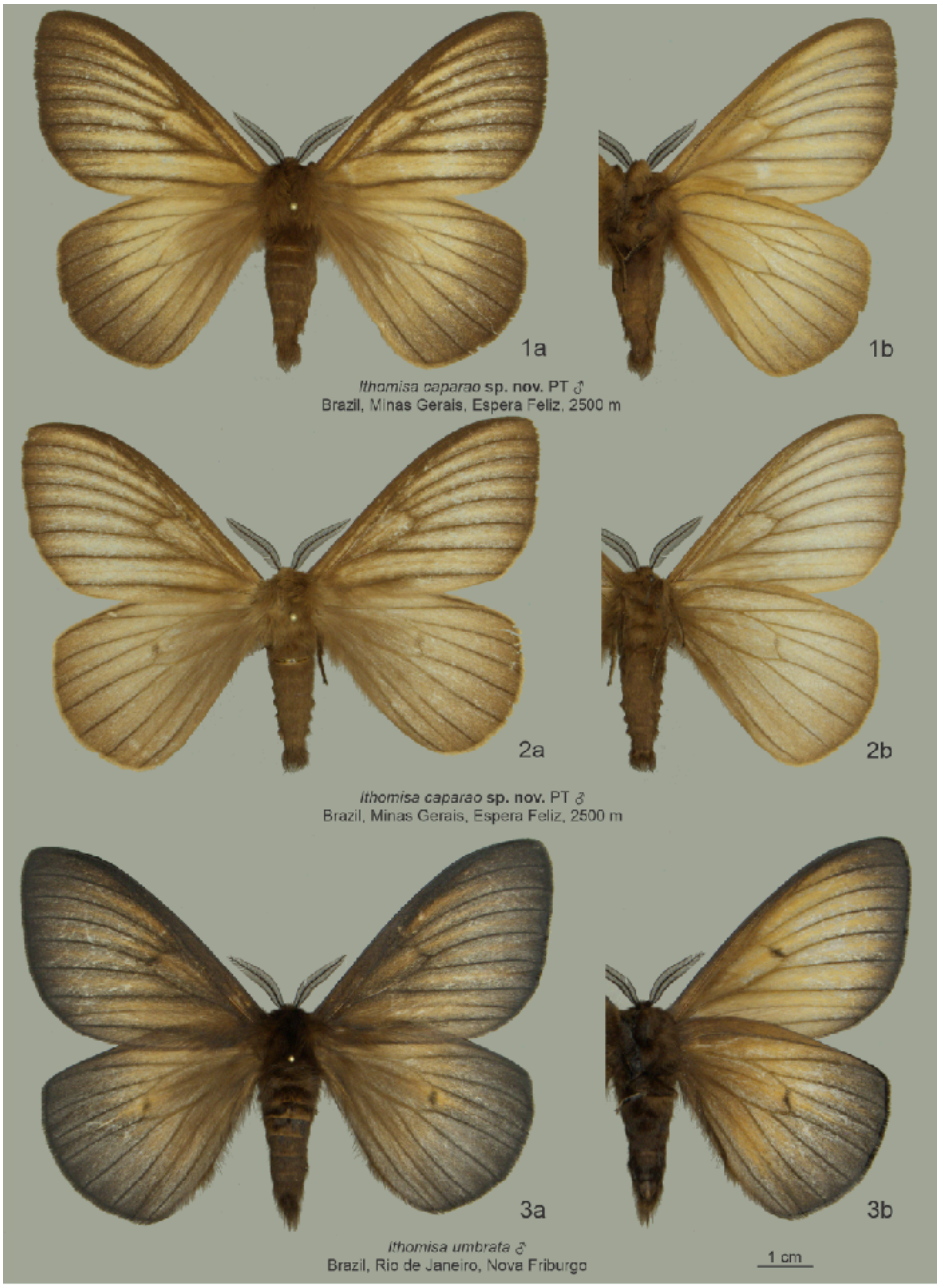

Plate 2, Figures 1–3. *Ithomisa* spp. *Ithomisa caparao* **sp. nov.**: 1a (dorsal), 1b (ventral) (CGCM 32.545); 2a (dorsal), 2b (ventral) (CGCM 32.266). *Ithomisa umbrata*: 3a (dorsal), 3b (ventral) (CGCM 50.091). Depository: 1–2, 3 (CGCM).

Ethology and geographical distribution. Males of *I. caparao* **sp. nov.** are active from around 10:00 a.m. to 5:00 p.m. It is endemic to the Serra do Caparaó, Minas Gerais, occurring between approximately 1,800 m and the highest elevations of around 2,900 m (Pls. 15-16; Pl. 17).

The Serra do Caparaó (Pls. 15-16; Pl. 17) is an isolated mountain range in southeastern Brazil, forming one of the highest and most distinctive highland systems within the Atlantic Forest domain. Its highest peak, Pico da Bandeira, reaches nearly 3,000 m in elevation, creating extensive areas of montane and high-altitude grassland vegetation surrounded by lower-elevation forest formations.

Owing to its geographic isolation and elevational complexity, the region harbours a distinctive biota, with numerous endemic and disjunct taxa recorded for plants (Moreira *et al*. 2021) and animals (Zornosa-Torres *et al*. 2020).

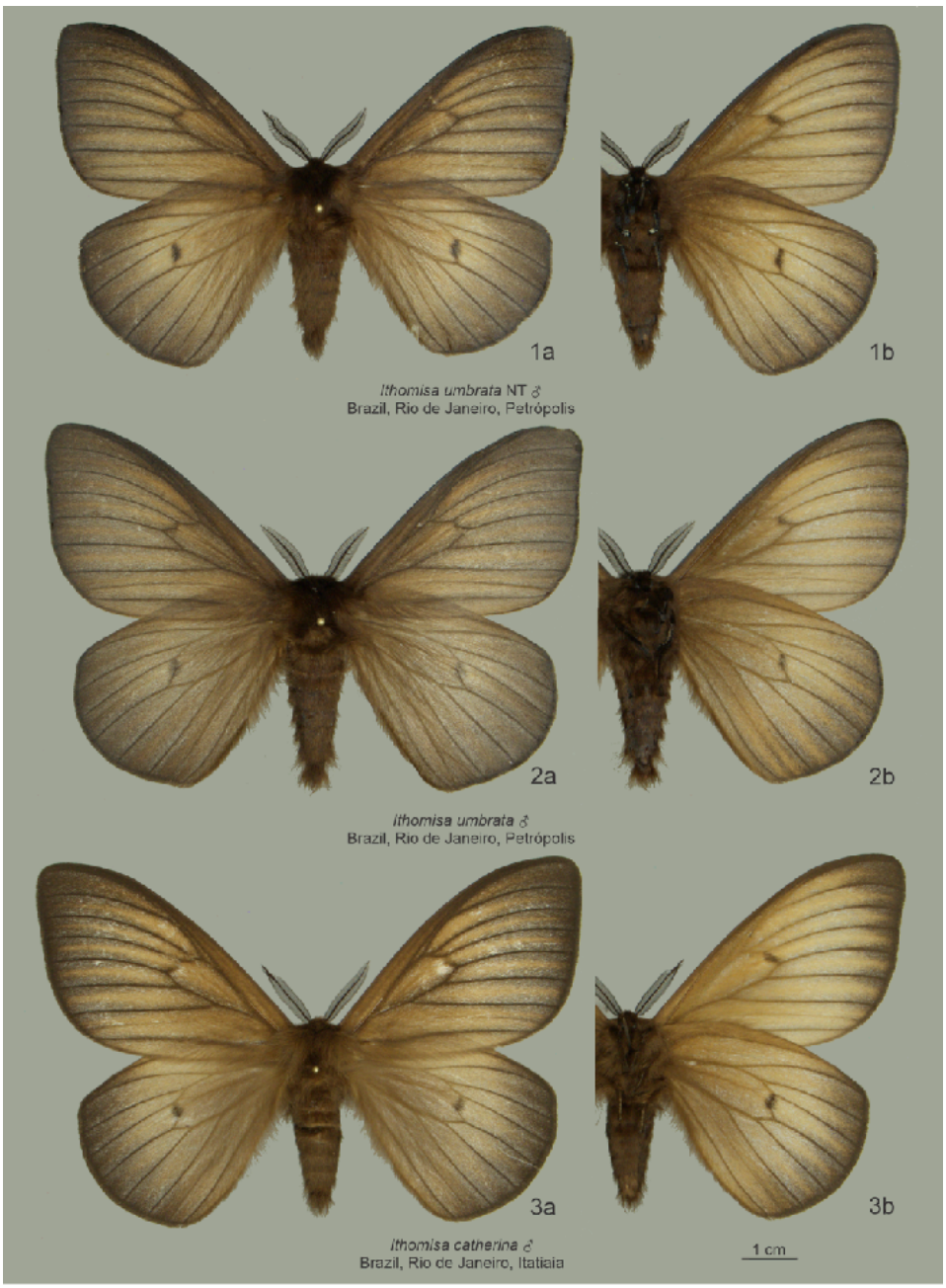

Plate 3, Figures 1–3. *Ithomisa* spp. *Ithomisa umbrata*: 1a (dorsal), 1b (ventral) (CGCM 28.142); 2a (dorsal), 2b (ventral) (CGCM 38.659). *Ithomisa catherina*: 3a (dorsal), 3b (ventral) (CGCM 50.753). Depository: 1 (DZUP), 2–3 (CGCM).

The massif is located approximately 220 km away in a straight line from the mountain systems of Rio de Janeiro, where *I. umbrata* occurs. Despite this relatively short geographic distance, the intervening lowlands and forested valleys likely act as important ecological barriers for taxa associated with open high-altitude environments. Such isolation may promote population differentiation and local endemism, particularly in groups with limited dispersal ability, such as Hemileucinae moths. The discovery of a distinct *Ithomisa* species in Serra do Caparaó reinforces the role of southeastern Brazilian mountaintops as centres of diversification and highlights the biogeographic importance of these naturally fragmented high-altitude grassland habitats.

Etymology. The specific epithet is derived from the Serra do Caparaó, where the type locality is located. A noun in the nominative singular standing in apposition to the generic name.

Remarks. The great majority of the examined males of *I. caparao* **sp. nov.** are relatively uniform in having a dark ground colour on all wings, with little to some contrast from the lighter brown interveinal areas, as shown in Pl. 1: Figs. 1-4, although lighter specimens may occur (Pl. 2: Figs. 1-2). The hindwing stigma is either weakly developed or absent, as in most specimens.

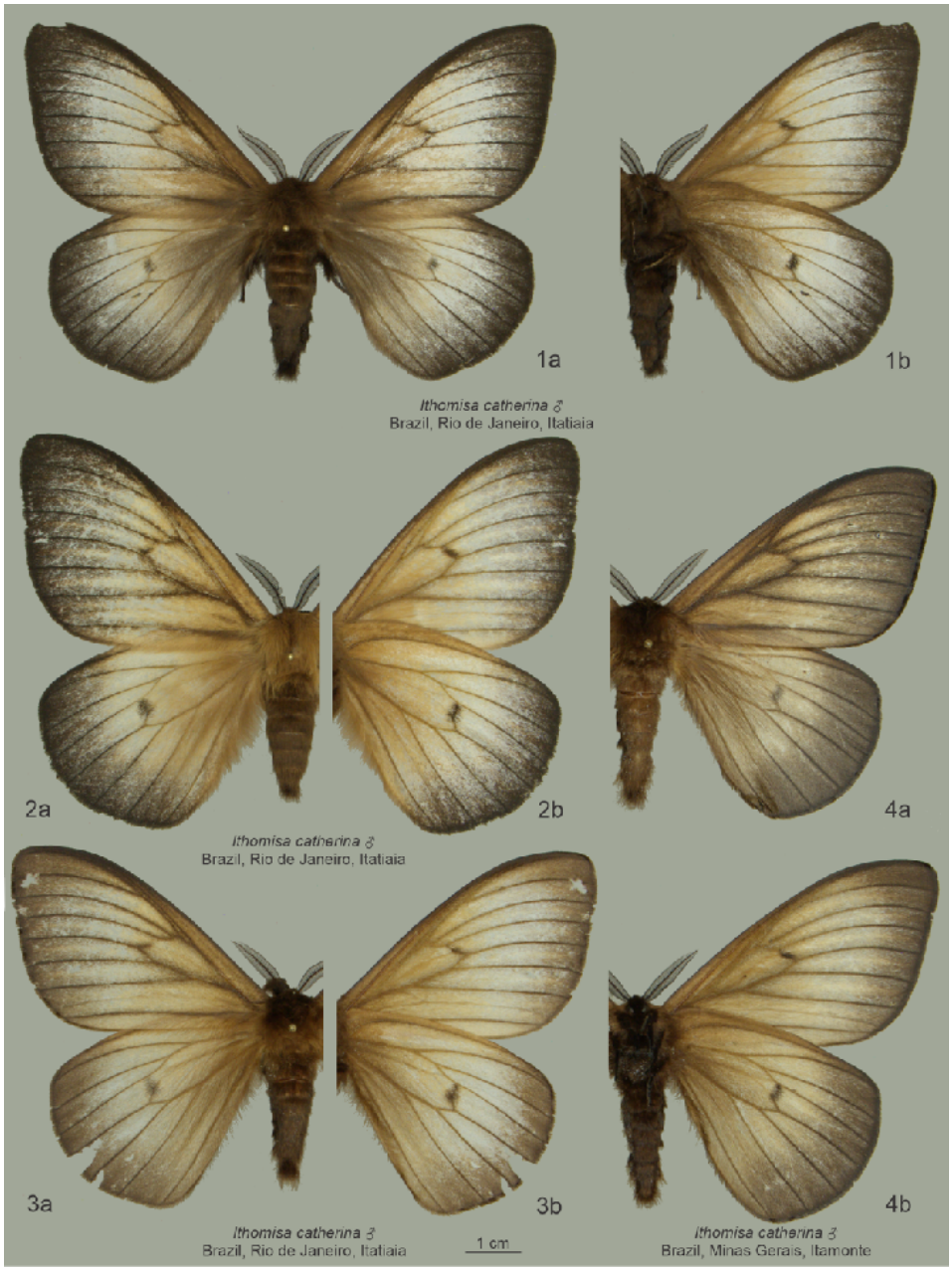

Plate 4, Figures 1–4. *Ithomisa catherina*: 1a (dorsal), 1b (ventral) (CGCM 51.591); 2a (dorsal), 2b (ventral) (CGCM 51.426); 3a (dorsal), 3b (ventral) (CGCM 24.421); 4a (dorsal), 4b (ventral) (CGCM 5.900). Depository: 1 (DZUP), 2–4 (CGCM).

Ithomisa umbrata Oiticica-Filho, 1958

Pl. 2: Figs. 3a-b, Pl. 3: Figs. 1a-2b, Pl. 9: Figs. 2a-b, Pl. 14: Figs. 3a-d

Ithomisa umbrata Oiticica-Filho (1958: 2; holotype ♂ with the following labels: *Ithomisa umbrata*, Oiticica-Filho, 1957, Holótipo ♂/ Morro Assú - 2.000 metros., Serra dos Órgãos, 24-Fev-1944, F. Segadas-Vianna/ 0575/ Holótipo, M. N. 32633 (Oiticica-Filho 1958 (destroyed); Figs. 1-2 (male dorsal), 3-4 (antenna), 5 (head), 6 (labial palpus), 7-9 (legs), 10 (venation), 11 (abdominal segment VIII), 12-14 (male genitalia)). – Lemaire (1996: 47). – Lemaire (2002: 924; Pl. 113, Figs. 3-4 (misidentification, *I. catherina*)). – d'Abrera (2012: 36). – Miranda *et al*. (2015: 144; misidentification (*I. catherina*)). – Kitching *et al*. (2018: table). – Leal & Zacca (2025: 13).

Diagnosis. The brown ground colour of the four wings separates males of *I. umbrata* (Pl. 2: Fig. 3; Pl. 3: Figs. 1-2) from males of *I. kinkelini* (Pl. 8: Figs. 2-3) and *I. catherina* (Pls. 4-7, Pl. 8: Fig. 1). But in the northeasternmost portion of the range of *I. catherina*, some males may exhibit a phenotype similar to that of *I. umbrata* (Pl. 3: Fig 3), making their separation difficult as the genitalia are similar (see Remarks, last paragraph). The single known female of *I. umbrata* (Pl. 9: Fig. 2) exhibits a uniform brown ground colour on all wings, a condition not observed in the females of any other congener. Diagnostic differences between *I. umbrata* and *I. caparao* **sp. nov.** are discussed under the preceding species.

Plate 5, Figures 1–3. *Ithomisa catherina*: 1a (dorsal), 1b (ventral) (CGCM 15.364); 2a (dorsal), 2b (ventral) (CGCM 7.145); 3a (dorsal), 3b (ventral) (CGCM 19.400). Depository: 1–3 (CGCM).

Examined specimens (in total 20 ♂ 1 ♀): **Brazil**. **Rio de Janeiro**. *Nova Friburgo*, Caledônia, 2200 m: 3 ♂, 25.I.1999, R. Koike leg. (CGCM 40.099, 40.663, 40.585; CGCM); 3 ♂, 5.III.1993, R. Koike leg. (CGCM 46.114, 46.720, 47.031; CGCM); 1 ♂, 13.I.1994, R. Koike leg. (CGCM 50.091; CGCM); 1 ♂, 27.XII.1997, E. Grossi leg. (CGCM 23.083; CGCM). *Petrópolis*, Morro do Açú,

2100-2200 m: 12 ♂ 1 ♀, 14-16.I.1999, R. Koike & C. Mielke leg. (CGCM 27.551, 28.142, 34.053, 38.659, 38.845, 39.201, 39.274, 39.275, 39.553, 39.857, 39.864, 39.961, 39.977; CGCM).

Plate 6, Figures 1–3. *Ithomisa catherina*: 1a (dorsal), 1b (ventral) (CGCM 31.360); 2a (dorsal), 2b (ventral) (CGCM 40.658); 3a (dorsal), 3b (ventral) (CGCM 33.236). Depository: 1–3 (CGCM).

Ethology and geographical distribution. At the type locality, males of *I. umbrata* are more active in the afternoon. All examined material comes from the Morro do Açú in Petrópolis and the Pico do Caledônia in Nova Friburgo, both in the state of Rio de Janeiro (Pls. 15-16).

Remarks. The original description of Oiticica-Filho (1958) mentions six male specimens from Morro do Açú, Petrópolis, Rio de Janeiro, Brazil. The entire type series was destroyed in the September 2018 fire (Corvisier 2022). To ensure the correct identification of *I. umbrata*, and in accordance with the provisions of Art. 75.3 of the International Code of Zoological Nomenclature (ICZN 1999), a male collected at the type locality and closely matching the holotype figured in the original description, is **herein designated as the neotype**; the specimen with the following labels:

Brazil – Rio de Janeiro (RJ), Petrópolis, Morro do Açú, 2100-2200 m, 14.-16.I.1999, 43°3'46.91"W, 22°29'23.12"S, Koike & C. Mielke leg./ 28.142 Col. C. Mielke/ NEOTYPUS *Ithomisa umbrata* Oiticica-Filho, 1958 C. Mielke & Koike det. 2026/; DZUP. The neotype is deposited in DZUP, a recognised institutional collection, which further satisfies the Code's requirements regarding accessibility and long-term preservation.

Plate 7, Figures 1–3. *Ithomisa catherina*: 1a (dorsal), 1b (ventral) (CGCM 54.854); 2a (dorsal), 2b (ventral) (CGCM 54.759); 3a (dorsal), 3b (ventral) (CGCM 24.177). Depository: 1–3 (CGCM).

All examined specimens of *I. umbrata* exhibit a phenotype similar to that of the neotype, being overall dark brown with more or less contrasting light-brown interveinal areas on the forewing (Pl. 2: Fig. 3; Pl. 3: Figs. 1-2); lighter forms have not been recorded. The single known female of *I. umbrata* is uniformly dark brown on all four wings, with only subtle light-brown interveinal markings (Pl. 9: Fig. 2). Both males and the female possess a faint hindwing stigma.

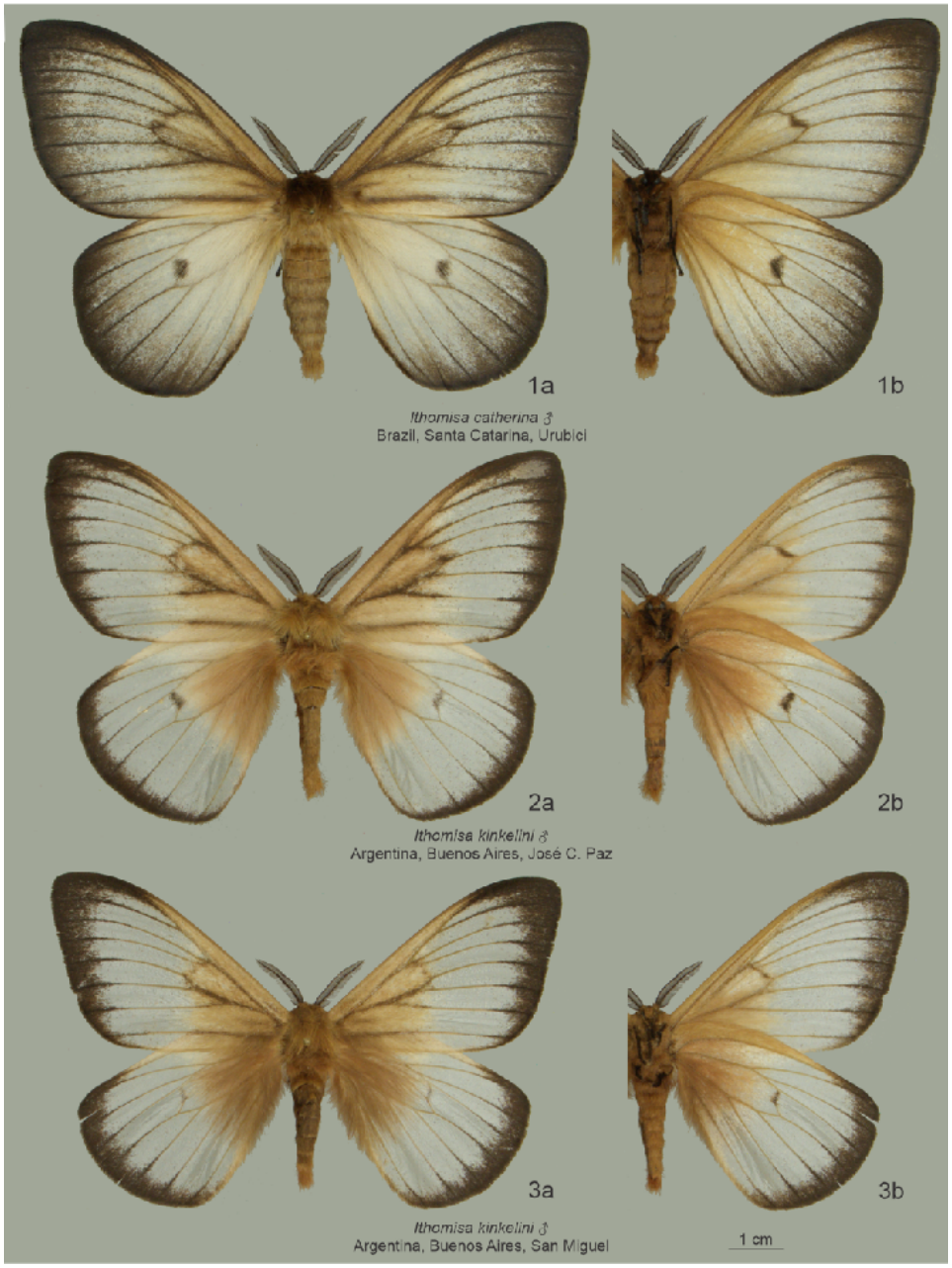

Plate 8, Figures 1–3. *Ithomisa* spp. *Ithomisa catherina*: 1a (dorsal), 1b (ventral) (CGCM 24.161). *Ithomisa kinkelini*: 2a (dorsal), 2b (ventral) (CGCM 15.641); 3a (dorsal), 3b (ventral) (CGCM 6.436). Depository: 1–3 (CGCM).

Lemaire (2002: Pl. 113, Figs. 3-4) illustrated male and female specimens of *I. catherina* as *I. umbrata*. Despite the typical *I. catherina* phenotype, his interpretation was based on the high altitude of Campos do Jordão in the state of São Paulo and the perceived similarity between the biotopes. In fact, however, the Serra da Mantiqueira (where *I. catherina* occurs) and the Serra do Mar (where *I. umbrata* occurs) are distinct mountain systems separated by the Paraíba do Sul River valley and differ markedly in vegetation and relief.

In addition to the type locality, *I. umbrata* has been recorded from the summit of Pico da Caledônia, in the municipality of Nova Friburgo. Interestingly, Morro do Açú (its type locality) forms part of an extensive high-altitude area extending between Petrópolis and Teresópolis in Rio de Janeiro state. In contrast, the Caledônia massif lies farther to the northeast and appears to lack any direct vegetational connection that could support the host plant of *I. umbrata*, presumably *Eryngium* (Apiaceae).

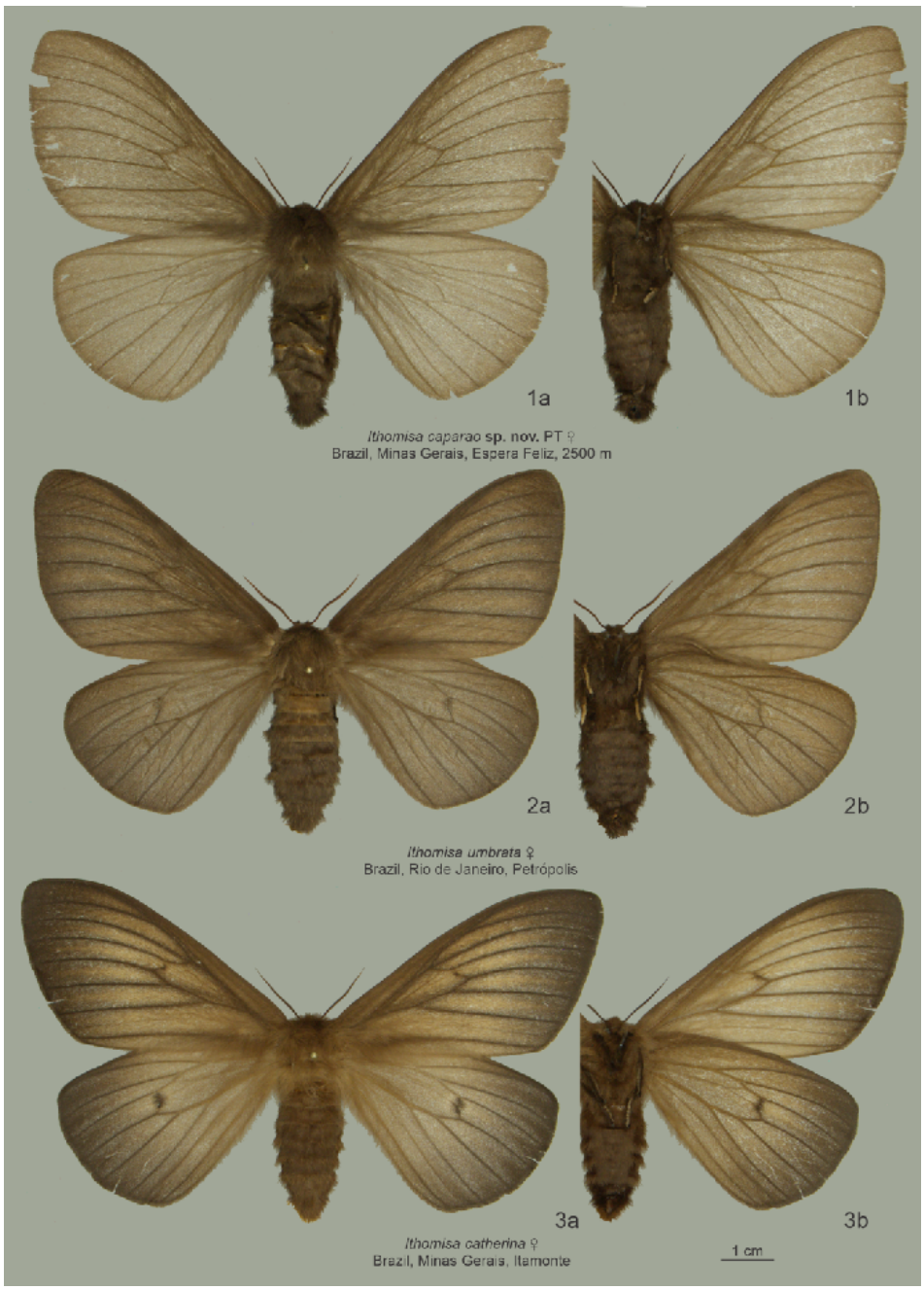

Plate 9, Figures 1–3. *Ithomisa* spp. *Ithomisa caparao* **sp. nov.**: 1a (dorsal), 1b (ventral) (CGCM 54.652). *Ithomisa umbrata*: 2a (dorsal), 2b (ventral) (CGCM 39.201). *Ithomisa catherina*: 3a (dorsal), 3b (ventral) (CGCM 24.472). Depository: 1 (DZUP), 2–3 (CGCM).

The distinct geological history and geomorphology of the Serra do Mar and Serra da Mantiqueira (Almeida & Carneiro 1998) may have promoted the isolation of their respective populations and contributed to the divergence of these highland *Ithomisa* taxa. Despite this isolation, some males from the northeasternmost portion of the range of *I. catherina* (Itatiaia Mountains) may exhibit a phenotype similar to that of *I. umbrata* (Pl. 3: Fig. 3), making their identification difficult. As noted by Oiticica-Filho (1958) and confirmed in the present study, *I. umbrata* has traditionally been distinguished from *I. catherina* only by wing colouration. However, the occurrence of completely brown individuals of *I. catherina* reduces the diagnostic value of this character, and the similar genitalia do not shed any light on the distinction between the two taxa. Nevertheless, both taxa are herein provisionally retained as distinct species pending additional evidence, particularly from molecular data.

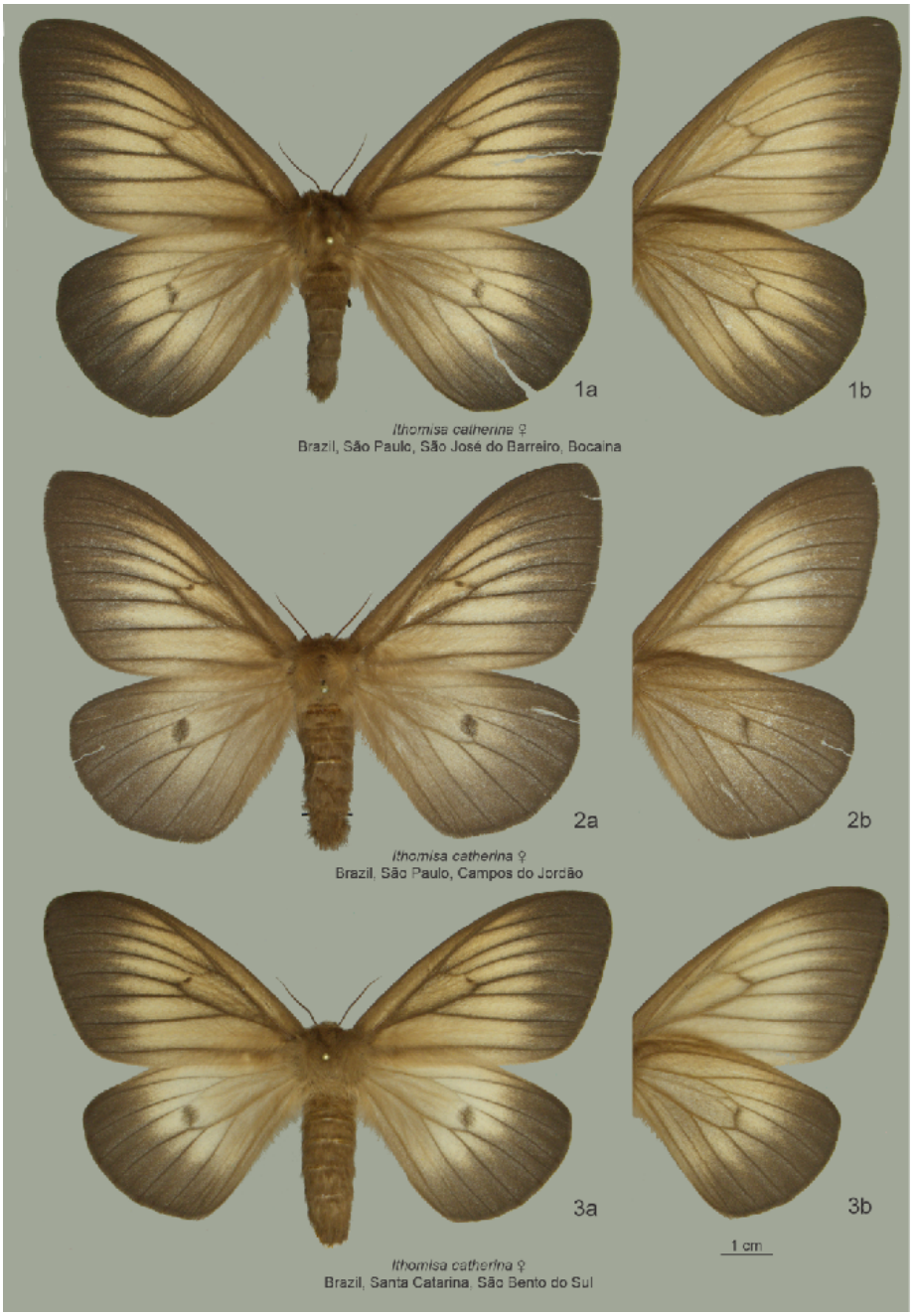

Plate 10, Figures 1–3. *Ithomisa catherina*: 1a (dorsal), 1b (ventral) (CGCM 36.373); 2a (dorsal), 2b (ventral) (CGCM 15.347); 3a (dorsal), 3b (ventral) (CGCM 32.410). Depository: 1–3 (CGCM).

Ithomisa catherina (Schaus, 1896)

Pl. 3: Figs. 3a-b, Pl. 4: Figs. 1a-4b, Pl. 5: Figs. 1a-3b, Pl. 6: Figs. 1a-3b, Pl. 7: Figs. 1a-3b, Pl. 8: Figs. 1a-1b, Pl. 9: Figs. 3a-3b, Pl. 10: Figs. 1a-3b, Pl. 11: Figs. 1a-3b

Heliconisa catherina Schaus (1896: 60). – Bouvier & Brèthes (1924: 4). – Bouvier (1930: 69). – Bouvier (1935: 350).

Heliconisa catharina [*sic*]: Bouvier (1928: 819). – Bouvier (1929a: 281). – Bouvier (1929b: 915).

Ithomisa catherina: Draudt (1930: 784; pl. 118c right (male dorsal), pl. 119b centre (female dorsal)). – Schüssler (1934a: 445). – Bourquin (1944: 81; misidentification, *I. kinkelini*). – Biezanko *et al*. (1949: 173). – Costa Lima (1950: 266). – Oiticica-Filho (1958: 4). – D'Araújo e Silva (1968: 268). – Ríos de Saluso *et al*. (1989; possibly misidentification, *I. kinkelini*). – Rizzo *et al*. (1990: 74; possibly misidentification, *I. kinkelini*). – Lemaire (1996: 47). – Ríos de Saluso (1997: 35; possibly misidentification, *I. kinkelini*). – Corseuil *et al*. (2002: 153). – Lemaire (2002: 923; lectotype male: southeast Brazil, Santa Catarina [without locality label] (USNM); Pl. 113, Figs. 5-6 (male and

female dorsal). – Cordo *et al.* (2004: 500; possibly misidentification, *I. kinkelini*). – Pastrana (2004: 114; possibly misidentification, *I. kinkelini*). – Specht *et al.* (2005: 155). – d'Abrera (2012: 36; Figs. (male and female dorsal; female possibly misidentification, *I. kinkelini*)). – Montero *et al*. (2013: 194; possibly misidentification, *I. kinkelini*). – Miranda *et al*. (2015: 144). – Kitching *et al*. (2018: table). – Orlandin *et al*. (2023: 168). – Leal & Zacca (2025: 13). – Silva *et al.* (2025: 6).

Dirphia (Ithomisa) catherina: Michener (1952: 469). – Biezanko *et al*. (1957: 88). – Biezanko *et al*. (1974: 115; possibly misidentification, *I. kinkelini*). – Biezanko *et al*. (1978: 20; possibly misidentification, *I. kinkelini*).

Ithomisa catharina [*sic*]: May *et al*. (2014: 173; two figs. (male and female dorsal)).

= *Ithomisa catherina* f. *impuncta*: Draudt (1930: 784; [male]).

Heliconisa caina [*sic*] Berg: Zikán (1927: 63; Figs. 4 (egg), 5 (larval segment), Pl. II, Figs. 3-4 (male and female dorsal); misidentification). – Zikán & Zikán (1968: 98; misidentification).

Ithomisa caterina [*sic*]: Elizalde & Lallana (2000: 274; possibly misidentification, *I. kinkelini*).

Ithomisa umbrata: Lemaire (2002: Pl. 113, Figs. 3-4; misidentification).

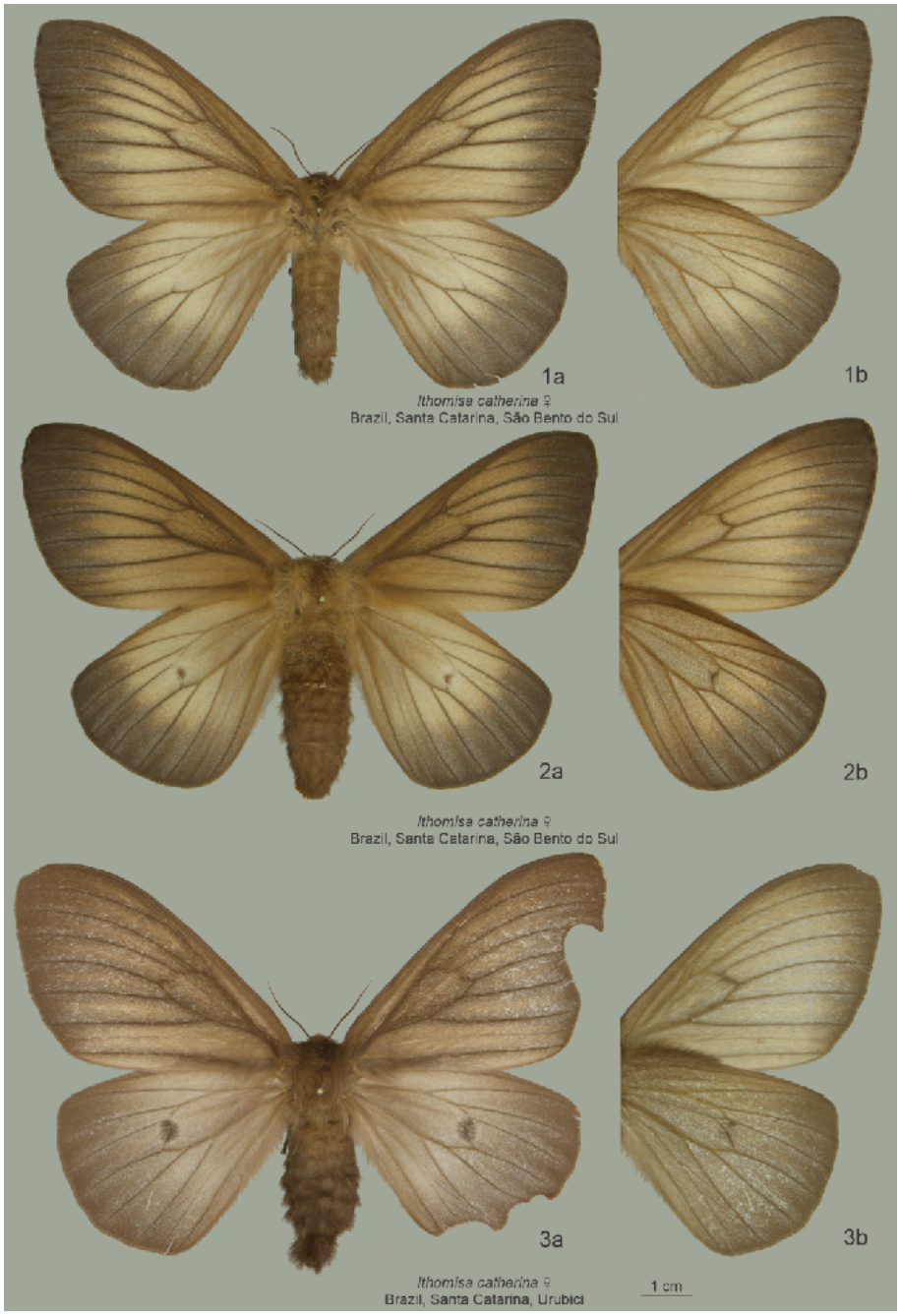

Plate 11, Figures 1–3. *Ithomisa catherina*: 1a (dorsal), 1b (ventral) (CGCM 22.760); 2a (dorsal), 2b (ventral) (CGCM 15.304); 3a (dorsal), 3b (ventral) (aberrant; CGCM 54.603). Depository: 1–3 (CGCM).

Diagnosis. Males of *I. catherina* show different phenotypes depending on the population (Pl. 3: Fig. 3; Pls. 4-7; Pl. 8: Fig. 1). Specimens from southern Brazil, especially from southern Santa Catarina and central Paraná, exhibit a narrow black marginal band on both wings as in *I. kinkelini* (Pl. 8: Figs. 2-3), but the hindwing base is never contrasting in *I. catherina* as it is in *I. kinkelini*. In the latter, it is orangish brown, whereas in the former, it is concolourous with the median area. Specimens from northeastern Santa Catarina and eastern Paraná, as the ones from eastern São Paulo, are easily identified by the wider black marginal band, contrasting with the median band. In the most northeastern part of its distribution, males are highly variable, but generally darker than other populations. The darkest specimens resemble *I. umbrata,* making identification difficult in some cases (see Remarks, last paragraph, of the preceding species). Females are variable (Pl. 9: Fig: 3, Pls. 10-11), with more or less contrast between the marginal, basal and median areas and hardly separated from its most similar species, *I. kinkelini* (Pl. 12).

Examined specimens (in total 50 ♂, 11 ♀): **Brazil**. **Minas Gerais**. *Itamonte*, Vargem Grande, 2100 m: 1 ♂, 5-10.III.2011, C. Mielke leg. (CGCM 5.900 [GB: JX216181]; CGCM). **Rio de Janeiro**. *Itatiaia*, Agulhas Negras, 2460 m: 1 ♂, 14.III.1935, Col. J.F. Zikán (IOC 29861; CEIOC); 3 ♂, 10-13.II.1994, C. Mielke leg. (CGCM 50.753 [SI: STDC970-24], 51.426, 51.591; CGCM); 2 ♂ 1 ♀, 5-10.III.2011, C. Mielke leg. (CGCM 24.421 [GB: JX216187], 24.438 [GB: JX216182], 24.472; CGCM). **São Paulo**. *São José do Barreiro*, Floresta, 1539 m: 2 ♂, 2-6.I.2016, C. Mielke leg. (CGCM 31.360, 31.399; CGCM); 1 ♀, 13.IV.1988, E. Joerke & C. Mielke leg. (CGCM 36.373; CGCM); 1 ♀, 15.III.1991, H. Thöny leg. (CGCM 32.435; CGCM). *Delfim Moreira*, 1980 m: 1 ♂, 15.I.1991, R. Koike leg. (CGCM 42.784; CGCM). *Campos do Jordão*, 1600-1900 m: 2 ♂ 1 ♀, 20-27.II.2001, V.O. Becker leg. (CGCM 15.347, 15.364, 15.430; CGCM). *Campos do Jordão*, Horto, 1580 m: 2 ♂, 24-28.II.2006, Decaëns & C. Mielke leg. (CGCM 19.432, 19.400; CGCM). *São Bento do Sapucaí*, Pedra do Baú, 1800 m: 1 ♂, 2.III.2003, G. Pereira & C. Mielke leg. (CGCM 7.145; CGCM); 2 ♂, 3.III.2004, A. Pereira leg. (CGCM 9.019, 9.152; CGCM). **Paraná**. *Ponta Grossa*, Abranches, 1050 m: 2 ♂, 1.III.1996, C. Mielke leg. (CGCM 54.759, 54.854; CGCM). Depository: 1-3 (CGCM). *Curitiba*, Guabirotuba: 1 ♂, 1.III.1981, C. Mielke leg. (CGCM 15.361; CGCM); 1 ♂, 20.XII.1986, C. Mielke leg. (CGCM 14.994; CGCM). *Rio Negro*, 1 ♀, 25.II.1968, O. Mielke leg. (CGCM 14.618; CGCM). **Santa Catarina**. *São Bento do Sul*, Rio Vermelho, 800-850 m: 1 ♂, 3.II.1993, O. Mielke & I. Rank leg. (CGCM 15.894; CGCM); 6 ♂ 1 ♀, II.1989, I. Rank leg. (CGCM 40.019, 40.341, 40.497, 40.555, 40.638, 40.658, 40.675; CGCM); 1 ♀, 3.III.1993, O. Mielke & Rank leg. (CGCM 15.304; CGCM); 1 ♂, 4.II.1998, I. Rank leg. (CGCM 1.360; CGCM); 1 ♀, III.2005, I. Rank leg. (CGCM 22.760; CGCM); 1 ♀, I.2009, I. Rank leg. (CGCM 26.569; CGCM); 1 ♂ 1 ♀, I.2017, I. Rank leg. (CGCM 32.410, 33.236; CGCM). *Santa Cecília*, Campo Alto, 1200 m: 1 ♂, 13.II.1976, O. Mielke & Z. Buzzi leg. (DZ 52.040; DZUP). *Lages*, Parque Pedras Brancas, 920 m: 2 ♂, 13.II.1973, O. Mielke & Sakakibara leg. (DZUP). *Urubici*, Morro da Igreja, 1800 m: 10 ♂, 13-19.II.2009, C. Mielke leg. (CGCM 22.797, 24.017 [GB: JX216184], 24.033, 24.081, 24.161, 24.177 [GB: JX216186], 24.337 [GB: JX216185], 24.353, 24.561 [GB: JX216183], 24.593); 4 ♂, 15-18.III.1988, C. Mielke leg. (CGCM 36.460, 36.471, 36.563, 36.684). *Urubici*, Santa Bárbara, 1350 m: 1 ♂, 1-3.II.1989, C. Mielke leg. (CGCM 39.276); 1 ♀, 20-23.II.1996, R. Koike leg. (CGCM 54.603; CGCM). *Urubici*, Vacas Gordas, 1350 m: 1 ♂ (CGCM 24.436). **Rio Grande do Sul**. *Vacaria*, Bela Vista, 950 m: 1 ♂, 27.II.1973, O. Mielke leg. (DZUP).

Ethology and geographical distribution. Males of *I. catherina* are active throughout most of the day, flying over the vegetation at heights of approximately 1-2 meters. It is a widespread species throughout southern and southeastern Brazil, occurring in the latter region mainly in higher areas of the Serra da Mantiqueira, where its host plant occurs (Pls. 15-16).

Remarks. Among the species of the genus, *I. catherina* is the only one in which at least the males exhibit such a high degree of variability (Pls. 4-7, Pl. 8: Fig. 1). The presence of a hindwing stigma in both males and females is variable and therefore of limited diagnostic value, contrary to the statement of Lemaire (2002). Variation in wing ground colour appears to follow a gradual clinal change, with darker male populations in the north and progressively lighter populations toward the south (Pl. 14). Females show a different pattern from males, as the northernmost and southernmost populations have uniformly grey or brown forewings, whereas those from São Paulo, Paraná, and northeastern Santa Catarina display a strongly contrasting marginal band on both wings (Pl. 16).

Nevertheless, male populations tend to exhibit a relatively stable wing pattern at the local scale, except in the northernmost portion of the distribution, where variation is more pronounced. In the highlands of Itatiaia, Rio de Janeiro, males range from specimens with a strongly contrasting black marginal band and light-brown basal and median areas (Pl. 4) to individuals that are almost entirely brown, with little contrast between the marginal band and the ground colour (Pl. 3: Fig. 3). Although the darker specimens resemble *I. umbrata*, including their genitalia, they are provisionally retained as *I. catherina* pending further evidence, such as DNA molecular data.

Males are easily identified in flight and are unlikely to be confused with any other lepidopteran species. Male specimens have been observed (without voucher specimens) at the following localities: **Brazil**. **Minas Gerais**: *Baependi*, Serra do Papagaio. **São Paulo**: *Queluz*, Pedra da Mina. **Paraná.** *Ortigueira*, Lageado; *Tibagi*, Paiol Velho and Estiva; *Lapa*. **Rio Grande do Sul**. *Muitos Capões* (see Pls. 15-16, salmon marks).

Ithomisa kinkelini Oberthür, 1881

Pl. 8: Figs. 2a-3b, Pl. 12: Figs. 1a-2b, Pl. 14: Figs. 4a-d

Ithomisa kinkelini Oberthür (1881: 114; male: Monte-de-Palmas, près Zarate (République argentine); pl. XX, Fig. 3 (male dorsal/ventral)). – Kirby (1892: 788). – Draudt (1930: 784; pl. 118c centre (male dorsal)). – Schüssler (1934a: 446). – Schüssler (1934b: 730). – Bouvier (1935: 351). – Oiticica-Filho (1958: 5). – Lemaire (1996: 47). – Corseuil *et al*. (2002: 153). – Lemaire (2002: 922; lectotype male: Argentina, Provincia Buenos Aires, Monte las Palmas, near Zárate, 26 Feb 1881 (Kinkelin) (NHMUK); Pl. 113, Figs. 1-2 (male and female dorsal)). – Nunes *et al*. (2003: 56; fig. 28 (male dorsal)). – Cordo *et al*. (2004: 500). – Specht *et al.* (2005: 155). – d'Abrera (2012: 36; Figs. (male and female dorsal)). – Mattoni & Penco (2012: 28; Figs. (male and female dorsal)). – May *et al*. (2014: 171; Fig. (male dorsal)). – Núñez Bustos (2015: 31). – Ríos *et al*. (2016: 62; Fig. 2B (male dorsal)). – Kitching *et al*. (2018: table). – Leal & Zacca (2025: 13).

Dirphia kinkelini: Berg (1886: 279). – Hayward (1969: 32).

Heliconisa kinkelini: Bouvier & Brèthes (1924: 4). – Bouvier (1929a: 281). – Bouvier (1930: 69). – Bouvier (1935: 351; Fig. 28 (male genitalia), Pl. 4, Fig. 5 (male dorsal)).

Dirphia (Ithomisa) kinkelini: Michener (1952: 469). – Biezanko *et al*. (1957: 88). – Biezanko *et al*. (1974: 115). – Biezanko *et al*. (1978: 20).

Ithomisa catherina (possibly misidentification): Bourquin (1944: 81; Figs. 2 (larva), 3 (pupa), 4 (female dorsal), 5 (male dorsal)). – Ríos de Saluso *et al*. (1989). – Rizzo *et al*. (1990: 74). – Ríos de Saluso (1997: 35). – Cordo *et al.* (2004: 500). – Pastrana (2004: 114). – d'Abrera (2012: 36; Fig. female dorsal). – Montero *et al*. (2013: 194).

Heliconisa (Dirphia) kinkellini [*sic*]: Varga (2000: 83; male and female dorsal).

Ithomisa caterina [*sic*]: Elizalde & Lallana (2000: 274; misidentification).

Heliconisa pagentecheri: Specht *et al*. (2008: 126; Fig. 5.81 (female dorsal; misidentification)).

Diagnosis. Males of *I. kinkelini* (Pl. 8: Figs. 2-3) can be recognised by the narrow black marginal bands on all four wings and by the scaled orangish-brown basal area of the hindwing. Among its congeners, it most closely resembles *I. catherina*, from which it differs in the characters discussed under the preceding species. In addition, the male genitalia are less robust than those of *I. catherina*,

with a shorter phallus and shorter saccular lobes (Pl. 14, Figs. 1b, 3b, 4b; see arrows). Females (Pl. 12) closely resemble those of *I. catherina*, although with less contrasting forewing areas.

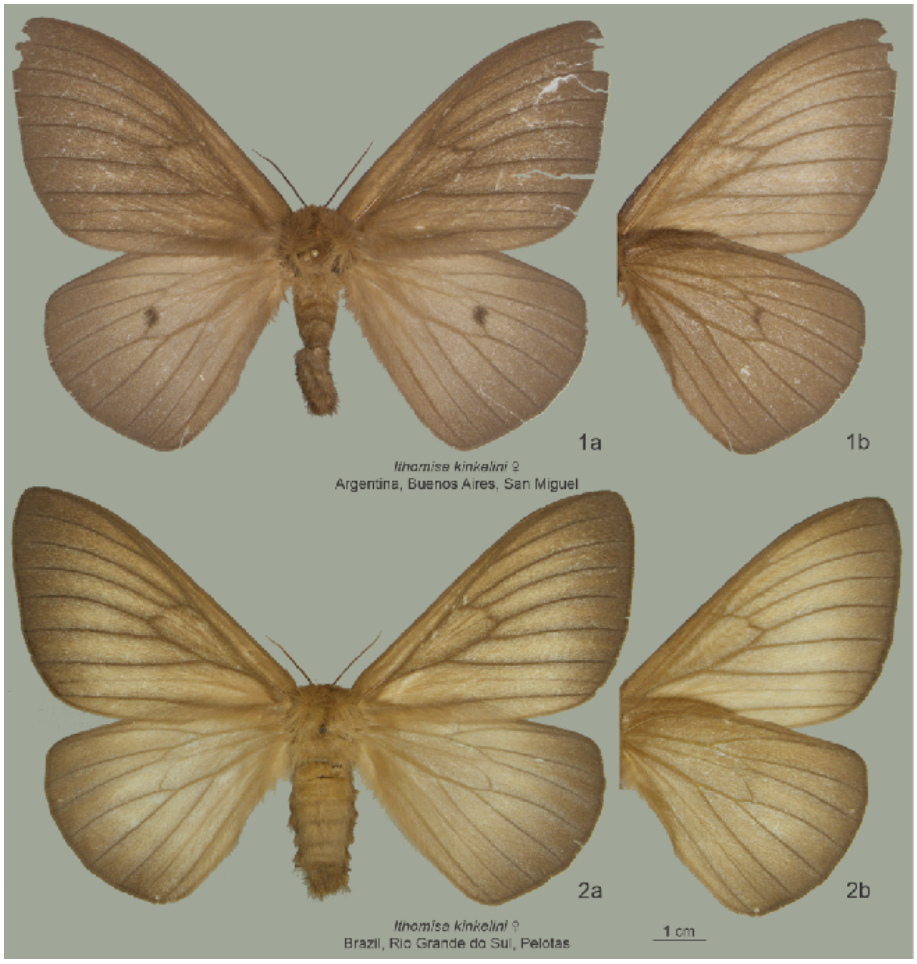

Plate 12, Figures 1–2. *Ithomisa kinkelini*: 1a (dorsal), 1b (ventral) (CGCM 15.271); 2a (dorsal), 2b (ventral) (CGCM 55.109). Depository: 1–2 (CGCM).

Examined specimens (in total 9 ♂, 3 ♀): **Brazil**. **Rio Grande do Sul**. No municipality/city: 1 ♂ (MZSP). *São Francisco de Paula*, Apanhador: 1 ♂, 3.III.2018, L. Bonatto leg. (CLB). *Pelotas*: 1 ♀, 3.III.1966, V.O. Becker leg. (CGCM 55.109; CGCM); 1 ♂, 3.IV.1967, V.O. Becker leg. (CGCM 15.267; CGCM); 1 ♀, 2-3.VI (MZSP 23.557; MZSP). **Argentina**. **Buenos Aires**. *San Miguel*, Campo de Mayo: 2 ♂, III.2003, A. Varga leg. (CGCM 6.436, 7.917; CGCM); 1 ♂, I.1993, A. Varga leg. (CGCM 1.359; CGCM). *José C. Paz*, Frino: 3 ♂ 1 ♀, III.2002, A. Varga leg. (CGCM 15.271, 15.419, 15.641, 15.807; CGCM).

Ethology and geographical distribution. As stated by Oberthür (1881), males of *I. kinkelini* are active from 9:00 am to 5:00 pm. It is a widespread species occurring from central and southern Rio Grande do Sul in Brazil to the province of Buenos Aires in Argentina and Paraguay (Pls. 15-16). It has been reported from Uruguay in some localities as *I. catherina* (Biezanko *et al*. 1957).

Remarks. All examined males exhibit a similar wing pattern with narrow black marginal bands on all four wings and a scaled orangish-brown basal area of the hindwing. In contrast, females are more variable, with the basal and median areas being more or less contrasting.

The only male of *Ithomisa* recorded from Paraguay (Ríos *et al*. 2016: Fig. 2B) is similar to specimens from Buenos Aires Province, despite the localities being separated by more than 800 km in a straight line. Although geographically distant, both records belong to the same Paraná River

basin and occur at nearly the same elevation (< 70 m a.s.l), suggesting that they may represent the same species (see the Remarks section under *I. lepta*).

As in *I. catherina*, male specimens have been observed (without voucher specimens) at the following localities: **Brazil**. **Rio Grande do Sul**: *Passo do Sobrado* and *Cambará do Sul*. **Uruguay**. **Rocha**: *Costa Azul* (iNaturalist 2006: images 358000378, 358217466). **Argentina**. **Buenos Aires**: *Baradero* (E. Núñez Bustos pers. com.) (see Pls. 15-16, light blue marks).

Ithomisa lepta (Druce, 1890)

Pl. 13: Figs. 1a-b

Coloradia lepta Druce, 1890: 501.
Heliconisa lepta: Bouvier (1929a: 281). – Bouvier (1930: 69). – Bouvier (1935: 351).
Ithomisa lepta: Draudt (1930: 784). – Schüssler (1934a: 446). – Schüssler (1934b: 730). – Lemaire (1996: 47). – Lemaire (2002: 925; Pl. 126, Fig. 9 (LT female dorsal)). – d'Abrera (2012: 36; Fig. (HT [recte LT] female dorsal)). – Kitching *et al*. (2018: table).

Plate 13, Figure 1. *Ithomisa lepta*: 1a (dorsal), 1b (ventral); NHMUK. Labels enlarged. © Trustees Natural History Museum (NHMUK), used with permission.

Remarks. *Ithomisa lepta* is known only from a single female specimen (Pl. 13: Figs. 1a-b) from an unknown locality in Paraguay (ex coll. Reeve), deposited in NHMUK. To date, only the lectotype female and one male have been recorded from that country. The overall dark brown ground colour of the lectotype suggests, considering the type locality, a possible relationship with the darker female specimens of *I. catherina* or *I. kinkelini*. Ríos *et al*. (2016) reported the first known male of *Ithomisa* from southwestern Paraguay. This record corroborates the occurrence of the genus in that country and, given its similarity to *I. kinkelini* (as mentioned above under that species), suggests that *I. lepta* may be a junior synonym of the latter species. However, no conclusions can be drawn regarding the true status of this species, as already noted by Lemaire (2002). Until additional

evidence, such as DNA barcode data, becomes available, *I. lepta* is provisionally retained as a valid species.

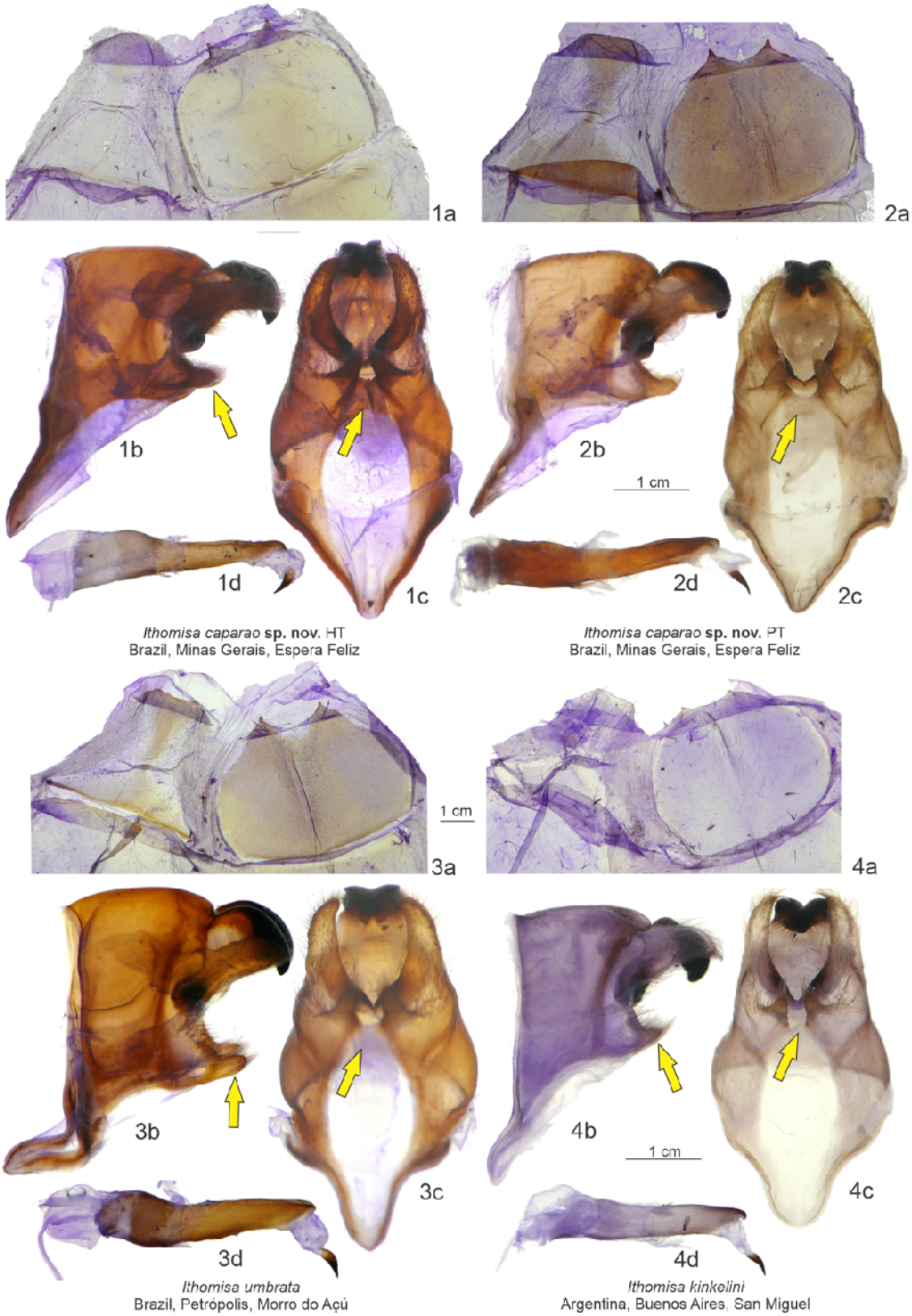

Plate 14. *Ithomisa* spp., male segment VIII and genitalia. *Ithomisa caparao* **sp. nov.**: 1a (tergite left, sternite right), 1b (lateral), 1c (ventral), 1d (phallus) (CGCM 54.703); 2a (tergite left, sternite right), 2b (lateral), 2c (ventral), 2d (phallus) (CGCM 33.128). *Ithomisa umbrata*: 3a (tergite left, sternite right), 3b (lateral), 3c (ventral), 4c (phallus) (CGCM 39.961). *Ithomisa kinkelini*: 4a (tergite left, sternite right), 4b (lateral), 4c (ventral), 4d (phallus) (CGCM 1.359). Depository: 1 (DZUP), 2–4 (CGCM).

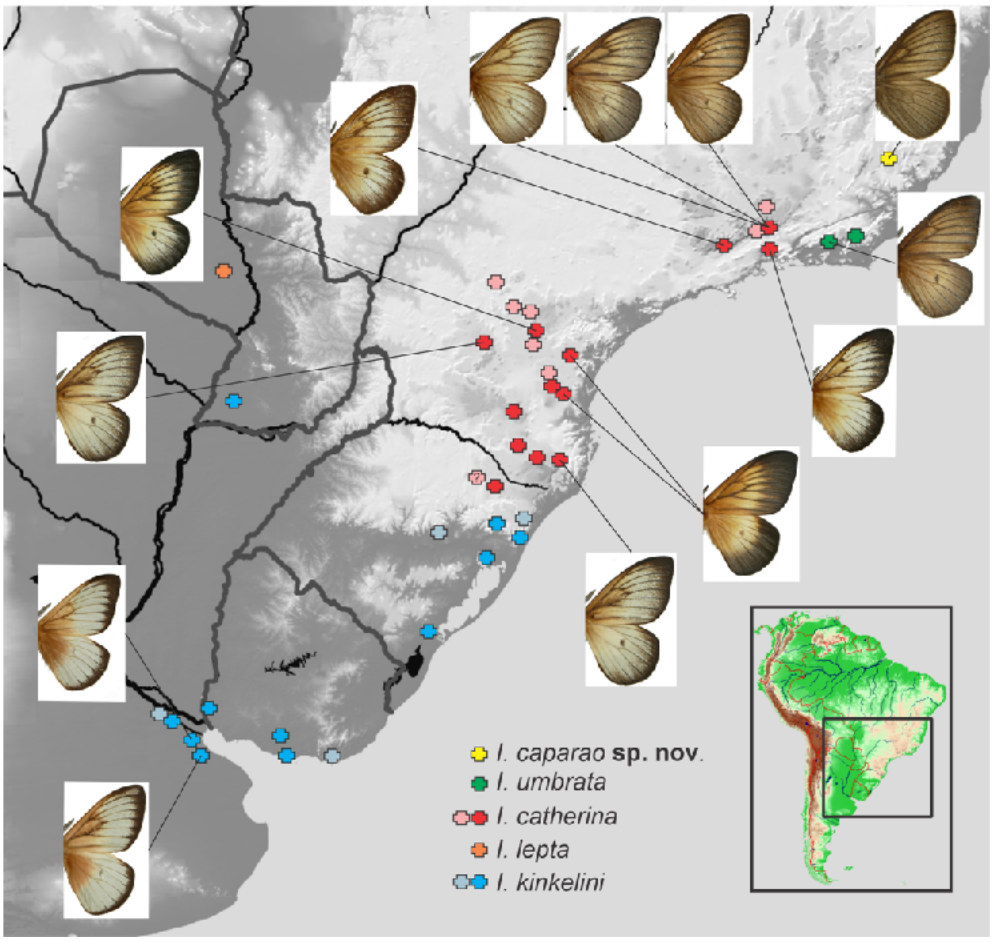

Plate 15. Distribution of *Ithomisa* spp. in southeastern and southern Brazil, Paraguay, and Argentina, showing different **male** phenotypes. Salmon and light blue dots represent observations of *I. catherina* and *I. kinkelini*, respectively, without voucher specimens. Orange dot indicates the centroid.

DISCUSSION

Due to the scarcity of diagnostic morphological characters among species of *Ithomisa*, species delimitation relies primarily on wing ornamentation patterns and a few attributes of the male genitalia. The geographic origin and distribution of specimens may provide only preliminary evidence for distinguishing taxa. Within an integrative taxonomic framework, molecular evidence is expected to provide additional support for evaluating species boundaries and may help test the current taxonomic arrangement. The taxonomy adopted herein therefore follows that previously proposed in the literature, except for the description of a new species from Serra do Caparaó.In the states of São Paulo and Rio de Janeiro, *Ithomisa* is restricted to high-altitude areas, above 1,800 m, where populations are geographically isolated by pronounced topographic complexity and elevational gradients. This landscape configuration likely promotes limited gene flow among populations, resulting in population structuring consistent with long-term isolation. Consequently, future molecular data are expected, as stated above, to shed light on the extent and nature of genetic differentiation within the genus, providing further insight into its evolutionary history under an allopatric diversification scenario driven by the orographic heterogeneity of the region.

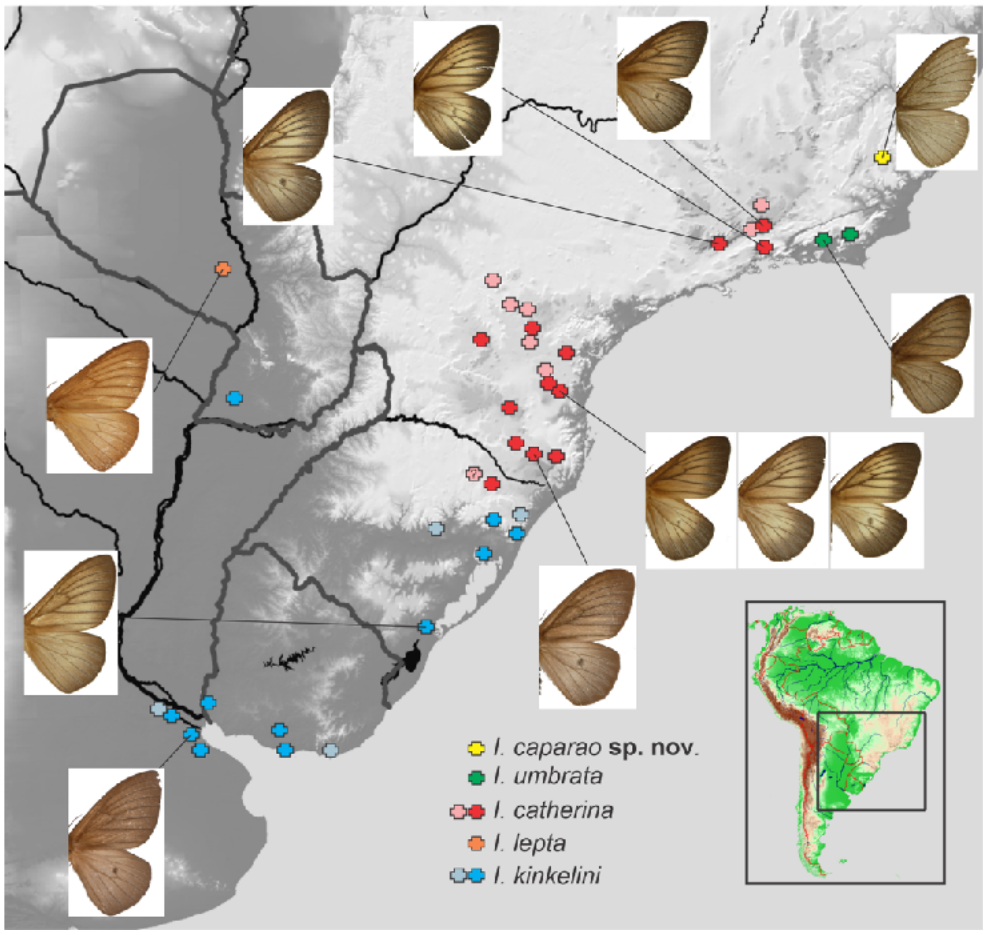

Plate 16. Distribution of *Ithomisa* spp. in southeastern and southern Brazil, Paraguay and Argentina with different **female** phenotypes. Salmon and light blue dots represent observations of *I. catherina* and *I. kinkelini*, respectively, without voucher specimens. Orange dot indicates the centroid.

Plate 17. Figures 1–2. Biotope of *I. caparao* **sp. nov.**, Serra do Caparaó, Espera Feliz, Minas Gerais, Brazil, at approximately 2,500 m a.s.l.

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(Caxias do Sul, Brazil) for providing data on specimens from Rio Grande do Sul; to Martin Abreu (Uruguay) for allowing us to use his record of *I. kinkelini* from Uruguay; to Renato Silva (MZSP) for providing data on specimens housed in that institution; and special thanks to Alessandro Giusti (NHMUK) for providing images of the lectotype of *Ithomisa lepta*. Finally, we thank Aidas Saldaitis and Ryan St Laurent for their valuable suggestions and corrections, which significantly improved the manuscript.

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