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Comparative study on the hypandrium of the Neotropical Biblidinae (Lepidoptera: Nymphalidae)

L. A. R. Leite, D. Bonfantti, A. L. Lidke, M. M. Casagrande & O. H. H. Mielke

Abstract

Biblidinae is a subfamily of Nymphalidae with over 250 species for the Neotropical Region. All males have a modified eighth sternum, this being the hypandrium. In order to demonstrate the structural variability and to assist in species identification, the morphological variations in species of 24 genera are illustrated and analyzed. Methods traditionally applied to dissection in Lepidoptera were used. To illustrate the variations, drawings were done with the aid of a camera lucida attached to a stereomicroscope and Scanning Electron Microscopy. The sclerite showed great variation with special highlight to the format, folds in the integument, the presence of spines and bristles.
KEY WORDS: Lepidoptera, Nymphalidae, abdominal plate, morphology, subgenital plate, Neotropical.

Estudo comparado dos hipândrios em Biblidinae neotropical (Lepidoptera: Nymphalidae)

Resumo

Biblidinae é uma subfamília de Nymphalidae com mais de 250 espécies na região Neotropical. Todos os machos têm o oitavo esterno modificado, sendo este o hipândrio. Com o objetivo de demonstrar a variabilidade estrutural e auxiliar na identificação das espécies, a variação morfológica das espécies de 24 gêneros foram ilustradas e analisadas. Foi utilizada a metodologia de dissecção usualmente aplicada a Lepidoptera. Para ilustrar as variações, desenhos foram feitos em estereomicroscópio com câmara clara acoplada e Microscopia Eletrônica de Varredura. O esclerito mostrou grandes variações, com destaque especial ao seu formato, dobras tegumentares, além de presença de espinhos e cerdas.
PALAVRAS CHAVE: Lepidoptera, Nymphalidae, placa abdominal, morfologia, placa subgenital, Neotropical.

Estudio comparative sobre el hypandrium de los Biblidinae Neotropical (Lepidoptera: Nymphalidae)

Resumen

Biblidinae es una subfamilia de Nymphalidae con más de 250 especies para la Región Neotropical. Todos los machos tienen una modificación en el octavo esternito, siendo éste el hypandrium. Con el objetivo de demostrar la variabilidad estructural y ayudar en la identificación de las especies, se ilustra y analiza la variación morfológica en las especies de 24 géneros. Se han usado métodos tradicionales aplicados a la disección en Lepidoptera. Para ilustrar las variaciones, los dibujos fueron hechos con ayuda de la cámara clara acoplada a un estereomicroscopio y Microscopía Electrónica de Barrido. El esclerito mostró grandes

variaciones, destacando especialmente en la forma, pliegues entre los tegumentos, y la presencia de espinas y cerdas.
PALABRAS CLAVE: Lepidoptera, Nymphalidae, placa abdominal, morfología, placa subgenital, Neotropical.

Introduction

Nymphalidae (Lepidoptera: Papilionoidea) comprises about 7,200 species, distributed in all habitats and continents except Antarctica. Among its various tribes and subfamilies, the systematic relationships are vaguely understood, however many studies demonstrate that the major subgroups are monophyletic. Although the phylogeny is not well defined, the relationship between subgroups is widely accepted (FREITAS & BROWN, 2004).

Biblidinae is a subfamily of Nymphalidae and according to LAMAS (2004), over 250 species are described for the Neotropical region, divided into thirty-two genera and six tribes. The butterflies are of small and medium size with quite varied coloration (COSTA LIMA, 1950), and their adults feed mainly on liquid from decaying animals or fruits (DEVRIES, 1987).

Among several morphological characteristics of Biblidinae, the most important is the presence of the hypandrium on the male abdomen; this structure supports the monophyly of the group and represents a modification of the eighth sternum, a sclerite located anteriorly to the male genitalia (JENKINS, 1990; HARVEY, 1991; FREITAS & BROWN, 2004; LEITE *et al.*, 2013), the same structure may have the denomination of abdominal plate (PIERCE, 1914; NICULESCU, 1978) or subgenital plate (SNODGRASS, 1935; KLOTS, 1956; MATSUDA, 1976), but in these cases, the term can be applied to the modification of the seventh and the ninth segment, and also to females.

Furthermore, in Nymphalidae, the hypandrium is regarded as an autapomorphy of Biblidinae of great importance for the identification of the species, playing a role of key character (JENKINS, 1990; ZUBEK *et al.*, 2015).

This study aims to describe the morphology of the hypandrium in the analyzed species in order to demonstrate the intergeneric structural plasticity and to help in the understanding of the classification and systematics of the Neotropical Biblidinae.

Material and Methods

The specimens are deposited in the Coleção Padre Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná (DZUP), Curitiba, Paraná, Brazil. They were analyzed according to availability. To observe the intraspecific variation, a minimum of five samples were studied for each species.

For the morphological studies, the abdomen of each specimen was removed and heated in potassium hydroxide (KOH) at a concentration of 10% to soften the structures and facilitate the removal of the scales; the heating time varied according to the size of the abdomen, approximately 3 minutes for smaller and 5 minutes for the larger ones. Subsequently, the genital apparatus was dissected with forceps for the removal of the hypandrium.

The sclerites were analyzed with the aid of a stereomicroscope with camera lucida. Illustrations were made using nankin drawing pen and the plates using Adobe Photoshop CS3® software. The hypandrium morphological variations were described and compared.

For the Scanning Electron Microscopy (SEM), the structures underwent dehydration through immersion in increasing concentrations of ethanol (70%, 80%, 90% and absolute) for 10 minutes at each concentration, and the absolute alcohol parts received a second bath of 10 minutes. Samples were prepared according to the following protocol: critical point with Bal-tec® CPD030 Critical Point Dryer and attached after that above aluminum stubs; gold/palladium coated with Bal-tec® SCD030 Sputter Coater. Images were done using a Jeol® JSM-6360LV microscope.

The hypandrium of species of 24 genera were illustrated and compared, representing 75% of the genera in 6 tribes. They include representatives of all Neotropical tribes (Table 1).

Table 1.– Studied species and their origin.

Specie	Tribe	Origin
Biblis hyperia nectanabis (Fruhstorfer, 1909)	Biblidinae	BRASIL – Bahia: Formosa do Rio Preto, Araça.
Asterope degandii bartletti (Godman & Salvin, 1878)	Epiphilini	BRASIL – Acre: Cruzeiro do Sul, Guellgebiet des Rio Jurua.
Batesia hypochlora C.Felder & R. Felder, 1862	Ageroniini	PERU – Madre de Dios: Parque Manu, Pakitza.
Callicore pygas eucale (Fruhstorfer, 1907)	Callicorini	BRASIL – Bahia: Formosa do Rio Preto, Araça.
Catacore kolyma (Hewitson, 1852)	Callicorini	BRASIL – Rondônia: Pimenta Buena.
Catonephele numilia neogermanica Stichel, 1899	Catonephelini	BRASIL – Paraná: Diamante do Norte, Estação Ecológica do Caiuá.
Cybdelis phaesyla (Hübner, [1831])	Catonephelini	BRASIL – Rio Grande do Sul: Tenente Portela, Parque Florestal Estadual Turvo.
Diaethria clymena (Cramer, 1775)	Callicorini	BRASIL – Paraná: Maringá.
*Dynamine postverta (*Cramer, 1779)	Eubagini	BRASIL – Paraná: Diamante do Norte, Estação Ecológica do Caiuá.
Ectima thecla lirina C. Felder & R. Felder, 1867	Ageroniini	BRASIL – Santa Catarina: Rio do Sul, Itopuranga.
Epiphile orea (Hübner, [1823])	Epiphilini	BRASIL – Rio de Janeiro: Itatiaia, Serra do Itatiaia.
Eunica eburnea Fruhstorfer, 1907	Catonephelini	BRASIL – Paraná: Curitiba, Parque Barreirinha.
Haematera pyrame (Hübner, [1819])	Callicorini	BRASIL – Paraná: Diamante do Norte, Estação Ecológica do Caiuá.
Hamadryas amphinome (Linnaeus, 1767)	Ageroniini	BRASIL – Paraná: Fenix.
Mestra hersilia apicalis (Staudinger, 1886)	Biblidini	BRASIL – Mato Grosso: Diamantino, Fazenda São João, Alto Rio Arinos.
Myscelia orsis (Drury, 1782)	Catonephelini	BRASIL – Paraná: Curitiba, Parque Barreirinha.
Nessaea obrinus (Linnaeus, 1758)	Catonephelini	BRASIL – Acre: Santa Rosa do Purus.
Nica flavilla (Godart, [1824])	Epiphilini	BRASIL – Paraná: Diamante do Norte, Estação Ecológica do Caiuá.
Panacea prola (Doubleday, [1848])	Ageroniini	PERU – Madre de Dios: Parque Manu, Pakitza.
Paulogramma pyracmon (Godart, [1824])	Callicorini	BRASIL – Paraná: Foz do Iguaçu.
Peria lamis (Cramer, 1779)	Epiphilini	PERU – Madre de Dios: Parque Manu, Pakitza.
Pyrrhogyra neaerea arge Gosse, 1880	Epiphilini	BRASIL – Paraná: Foz do Iguaçu.
Sea sophronia (Godart, [1824])	Catonephelini	BRASIL – São Paulo: Ubatuba.
Temenis laothoe santina Fruhstorfer, 1907	Epiphilini	BRASIL – Paraná: Diamante do Norte, Estação Ecológica do Caiuá.

Results

Biblis hyperia nectanabis (Cramer, 1779) (Figs 1, 2, 49-51)

Hypandrium subtriangular with enlarged distal half, width of the distal half approximately with the same length of the anterior half. Proximal margin concave with tapered and divergent projections arranged laterally. In dorsal view, distal middle portion covered with bristles and long spines on the edge. In ventral view, distal half with thin lateral projections with spines on the middle portion, and covered with bristles on the medium-distal portion. Lateral view concave, anteriorly slender and enlarged at the distal half.

Asterope degandii bartletti (Godman & Salvin, 1878) (Figs 3, 4, 52-54)

Hypandrium subrectangular with mild constriction in the distal third, about four times longer than it is wide, convex proximal margin. In dorsal view, distal portion with a fold of the integument towards to the dorsal portion, larger spines on the lateral-distal extremities and smaller in middle-distal margin. In ventral view, distal half covered with bristles on the median longitudinal portion with a small longitudinal groove line "U" shaped. Lateral view, thin, proximal portion larger and decreasing gradually towards the distal end.

Batesia hypochlora C. Felder & R. Felder, 1862 (Figs 5, 6, 55-57)

Hypandrium subtriangular with enlarged and convex proximal base, width and length of approximately the same size. In dorsal view, distal third surrounded by a thin membrane, concave on

the median-distal margin, this last one being covered with bristles. In ventral view, presence of bristles on the distal half and two longitudinal lines distally convergent on the anterior portion of the bristles. Lateral view subtriangular, enlarged on the proximal portion, decreasing gradually in the distal direction, distal end thin and folded towards the dorsal region.

Callicore pygas eucale (Fruhstorfer, 1907) (Figs 7, 8, 58-60)

Hypandrium subrectangular with strong constriction in the distal third, generating an "hourglass" aspect, about 4.5 times longer than wide, anterior margin with conspicuous median concavity. In dorsal view, distal portion bilobed, enlarged and subtriangular shaped with two spiniform lateral-distal projections folded towards the dorsal region, median-distal margin slightly concave. In ventral view, distal enlarged portion marginally covered with bristles. Lateral view with cylindrical appearance, and distal portion curved towards the dorsal side.

Catacore kolyma (Hewitson, 1852) (Figs 9, 10, 61-63)

Hypandrium subrectangular with constriction on the distal two-thirds, generating an "hourglass" aspect, about 2.5 times longer than wide, anterior margin with conspicuous median concavity. In dorsal view, distal portion with bifurcate aspect and fold of the integument towards the dorsal region, posterior margin concave, forming a "C" aspect and covered with bristles. In ventral view, anterior half with small bilateral grooves "J" shaped and median-distal third covered with bristles. Lateral view cylindrical with distal portion projected dorso-posteriorly.

Catonephele numilia neogermanica Stichel, 1899 (Figs 11, 12, 64-66, 123, 124)

Hypandrium subrectangular, median constriction generating "hourglass" aspect, about 2 times longer than wide, anterior margin bilobed with conspicuous median concavity. In dorsal view, distal portion with two bilateral "rami" projections, covered with spines on the inner margin and folds of the integument at the basis of the projections on the median region of the hypandrium. In ventral view, medium-distal half covered with bristles. Lateral view thin, enlarged on the proximal region and decreasing towards the distal end.

Cybdelis phaesyla (Hübner, [1831]) (Figs 13, 14, 67-69)

Hypandrium subquadrangular, medium-proximal margin with a smooth "V" shaped concavity. In dorsal view, lateral-distal projections resembling a "rami" with long spines on the extremities, median-distal edge with concave aspect, presenting sparse bristles distributed along the margin and a small subtriangular projection medially. In ventral view, median-distal portion covered with bristles. Lateral view, subtriangular, proximal portion oval shaped, decreasing gradually towards the distal third, this last one presenting bristles and long spines on its dorso-posterior extremity.

Diaethria clymena (Cramer, 1775) (Figs 15, 16, 70-72)

Hypandrium subrectangular with constriction on the distal two-thirds, generating "hourglass" aspect, about 2.5 times longer than wide, anterior margin with conspicuous median concavity. In dorsal view, proximal third enlarged, middle portion with longitudinal lines forming a central groove, median-distal extremity bifurcated, posterior margin "C" shaped with bristles. In ventral view, media longitudinal lines forming two bilateral grooves and median-distal third covered with bristles. Lateral view, elongated and cylindrical, distal portion smoothly curved towards the dorsal portion, longitudinal lines visible on the distal two thirds, bristles ventrally located on the distal third.

Dynamine postverta (Cramer, 1779) (Figs 17, 18, 73-75)

Hypandrium subrectangular with constriction on the distal third, generating "hourglass" appearance, about 3.3 times longer than wide, medium-proximal margin bilobed. In dorsal view, distal third thin with bifid distal extremity. Proximal third with small circular spot medially. Lateral view,

subtrapezoidal, proximal third elongated, extended gradually towards the median portion, distal third thin and curved towards the dorsal side.

Ectima thecla lirina C. Felder & R. Felder, 1867 (Figs 19, 20, 76-78)

Hypandrium subrectangular with median constriction, generating "hourglass" aspect, about 4.5 times longer than wide, anterior margin with smooth concavity. Dorsal view with two bilateral long and slender projections, large on the base located on the half of the hypandrium's length and thin until the distal extremity. In ventral view, posterior margin with smooth concavity. In lateral view, slender, proximal portion large and decreasing its thickness towards the distal end, distal third conspicuously thin and ventrally covered by membrane.

Epiphile orea (Hübner, [1823]) (Figs 21, 22, 79-81)

Hypandrium subrectangular with constriction on its distal two-thirds, forming "hourglass" aspect, about 4.5 times longer than wide, anterior margin with smooth concavity. In dorsal view, distal portion bifid, slightly projected laterally with serrated margin and quadrangular aspect, median-distal margin with conspicuous concavity covered with numerous bristles. Ventral view, proximal third with two bilateral curved grooves, median portion with two bilateral pararell grooves, distal third covered with numerous bristles. Lateral view, slender, distal portion projected towards the dorsal side.

Eunica eburnea Fruhstorfer, 1907 (Figs 23, 24, 82-84)

Hypandrium subrectangular, about 2.5 times longer than wide, median proximal margin with folds of the integument curved towards the ventral side. Dorsal view with distal bilateral projections, perpendicular to the longitudinal axis of the hypandrium. In ventral view, median distal portion covered with bristles. Lateral view with cylindrical aspect, distal portion with spiniform dorsal projection.

Haematera pyrame (Hübner, [1819]) (Figs 25, 26, 85-87)

Hypandrium subrectangular with conspicuous median constriction, generating "hourglass" aspect, about 2 times longer than wide, anterior margin with subtriangular bilateral projections. Dorsal view, distal third enlarged with long spines on the latero-distal extremities and smaller spines along the rest of the margin. Ventral view, distal third covered with bristles medially. In lateral view, slender with concave aspect, proximal margin bifid.

Hamadryas amphinome (Linnaeus, 1767) (Figs 27, 28, 88-90, 127)

Hypandrium subrectangular, proximal margin with concavity and bilateral thin projections. In dorsal view, distal margin bilobed with latero-distal spines and bristles on the median-distal margin. Rami present, bilateral and distally located, elongated with the same length of the hypandrium, hollow structure with aperture on its proximal region. Ventral view, median distal portion covered with bristles, rami covered with spines. Lateral view, proximal region thin, distal margin lobe shaped, rami distally projected from the dorsal third.

Mestra hersilia apicalis (Staudinger, 1886) (Figs 29, 30, 91-93)

Hypandrium subquadrangular, about 2 times longer than wide, proximal margin with smooth concavity medially. Dorsal view, latero-distal folds of the integument on the distal third, covered with bristles on the distal margin. In ventral view, distal half covered with numerous bristles. Lateral view with cylindrical aspect, proximal portion dorsally projected as a lobe, distal third presenting bristles on the ventral half.

Myscelia orsis (Drury, 1782) (Figs 31, 32, 94-96, 125, 126)

Hypandrium suboval, about 2 times longer than wide, proximal margin with median concavity, this last one being more conspicuous in ventral view. Dorsal view with latero-distal folds of the integument projected towards to the median longitudinal line of the structure and covered with spines

on the distal margin. In ventral view, median distal third covered with bristles. Lateral view with cylindrical aspect, median proximal portion enlarged and decreasing towards to the distal portion, distal third dorsally projected, covered with bristles ventrally and spines distally.

Nessaea obrinus (Linnaeus, 1758) (Figs 33, 34, 97-99)

Hypandrium subquadrangular on the proximal half and subrectangular on the distal half, about 2.5 times longer than wide, median proximal margin with conspicuous concavity. In dorsal view, distal half with fold of the integument towards to the dorsoposterior side and covered with bristles along the median longitudinal area, bilateral convergent projections distally located with spines on the distal end. Ventral view median-longitudinally covered with bristles in the distal two-thirds, bilateral lines along the bristles distributions. In lateral view, proximal portion enlarged and suboval, distal half thin and dorsally curved, presenting a dorsoposterior projection on the anterior half.

Nica flavilla (Godart, [1824]) (Figs 35, 36, 100-102, 121, 122)

Hypandrium subrectangular with smooth constriction on the distal third, generating "hourglass" aspect, about 2.5 times longer than wide, median proximal margin with smooth concavity. In dorsal view, fold of the integument distally located with bilateral spine and bristles medially located, distal margin with smooth concavity. Ventral view covered with numerous bristles on the distal half and with distal margin bilobed. Lateral view, subtrapezoidal, dorso-proximal margin as a lobe, gradually decreasing towards to the distal portion, distal half presenting bristles ventrally, spines on the dorso-distal extremity and on the ventrodistal margin, distal end bilobed.

Panacea prola (Doubleday, [1848]) (Figs 37, 38, 103-105)

Hypandrium subquadrangular, median proximal margin with concavity. In dorsal view, fold of the integument on the distal third dorsally projected, laterodistal folds covered with spines, distal margin with spines and bristles, distal half of the fold with bristles. Ventral view with bristles on the distal half. Lateral view, subrectangular, enlarged on the distal third, bristles distributed along the distal two-thirds and distal margin with conspicuous distributions of spines.

Paulogramma pyracmon (Godart, [1824]) (Figs 39, 40, 106-108)

Hypandrium subrectangular, about 6 times longer than wide, anterior margin with conspicuous concavity. In dorsal view, marginal folds of the integument on the proximal and distal thirds, dorsally projected fold of the integument on the distal end, distal extremity bilobed with distal projections "claw" shaped. Ventral view with the same aspect of the dorsal view, bilobed distal end presenting serrated margin. Lateral view, slender, larger on the proximal portion and gradually decreasing towards to the distal region, distal end dorsally projected.

Peria lamis (Cramer, 1779) (Figs 41, 42, 109-111)

Hypandrium subrectangular with median constriction, generating "hourglass" aspect, about 2 times longer than wide, median proximal margin with smooth concavity. In dorsal view, fold of the integument on the distal fifth, distal margin covered with bristles and long latero-distal spines. Ventral view, median distal third covered with numerous bristles. Lateral view, cylindrical, proximal half enlarged and decreasing towards to the distal region, distal margin with long spines dorsally projected.

Pyrrhogyra neaerea arge Gosse, 1880 (Figs 43, 44, 112-114)

Hypandrium subrectangular, about 2 times longer than wide, median proximal margin with concavity. In dorsal view, fold of the integument on the distal margin, this one covered with spines. Ventral view, bristles distributed on the distal fifth, distal margin concave with bilateral subquadrangular projections. Lateral view, subrectangular, proximal half enlarged, distal half thin with ventral bristles.

Sea sophronia (Godart, [1824]) (Figs 45, 46, 115-117)

Hypandrium subrectangular, about 1.5 times longer than wide, proximal margin bilobed. Dorsal view, distal margin presenting two bilateral and two median dentated projections, forming three concavities covered with bristles along the distal margin. Ventral view with the same aspect of the dorsal view and presenting numerous bristles distributed along the distal region. Lateral view, subtrapezoidal, anterior two-thirds thin, distal third enlarged and dorsally projected in a triangular shape.

Temenis laothoe santina Fruhstorfer, 1907 (Figs 47, 48, 118-120, 128)

Hypandrium subrectangular, large on the anterior half and thin on the distal half, about 5.5 times longer than wide, proximal margin with smooth concavity. In dorsal view, fold of the integument on the distal fifth, this one covered with bristles medially and long spines bilaterally. In ventral view, distal half covered with bristles irregularly distributed, distal margin with small concavity. Lateral view, slender, cylindrical on the anterior half, distal half thin with ventral bristles and distal portion dorsally projected, this one with subquadrangular aspect.

Discussion

Through the results obtained in this study, it was observed that the hypandrium has great intrageneric structural variability and its characters added to the analysis of other structures, such as genitalia and venation, can assist greatly in systematic studies in Biblidinae. No intraspecific variation in hypandrium morphology was observed.

The hypandrium is antero-ventral to the male genitalia, a modification of the eighth sternum, with more sclerotization compared to other sternites. All species discussed here have this structure, confirming previous works that treat it as the main morphological character sustaining the monophyly of the subfamily (JENKINS, 1990; HARVEY, 1991; FREITAS & BROWN, 2004; LEITE *et al.*, 2013).

The twenty-four analyzed species have large structural variation and among the most important characters of the hypandrium, the first concerns the shape, in which four states were determined: subquadrangular, in *Cybdelis phaesyla* and *Panacea prola prola*; subrectangular with median constriction, generating "hourglass"aspect, present in *Callicore pygas eucale*, *Catacore kolyma*, *Catonephele numilia neogermanica*, *Diaethria clymena*, *Dynamine postverta*, *Ectima thecla lirina*, *Epiphile orea*, *Haematera pyrame, Myscelia orsis*, *Nessaea obrinus*, *Nica flavilla*, *Peria lamis* and *Temenis laothoe santina*; subrectangular in *Asterope degandii bartletti, Eunica eburnea, Hamadryas amphinome, Mestra hersilia apicalis, Paulogramma pyracmon, Pyrrhogyra neaerea arge* and *Sea sophronia*; and subtriangular in *Batesia hypochlora* and *Biblis hyperia nectanabis*.

Other important characteristics are: distal portion with integumental fold present in half of all analyzed species: *Asterope degandii bartletti*, *Batesia hypochlora*, *Callicore pygas eucale*, *Catacore kolyma*, *Mestra hersilia apicalis*, *Nessaea obrinus*, *Nica flavilla*, *Panacea prola*, *Paulogramma pyracmon*, *Peria lamis*, *Pyrrhogyra neaerea arge* and *Temenis laothoe santina*; the presence of spines was observed in *Asterope degandii bartletti*, *Biblis hyperia nectanabis, Catonephele numilia neogermanica*, *Cybdelis phaesyla*, *Haematera pyrame*, *Hamadryas amphinome*, *Myscelia orsis*, *Nessaea obrinus*, *Nica flavilla, Panacea prola*, *Peria lamis*, *Pyrrhogyra neaerea arge* and *Temenis laothoe santina*.

In addition to the characters listed above, another one is efficient and essential for differentiation of species, the presence or absence of rami. JENKINS (1983) in his revision of *Hamadryas* did not mention the term hypandrium, only rami, which leads to understand that it is an independent structure. However, in later revisions of the genera *Catonephele*, *Ectima*, *Epiphile*, *Eunica*, *Myscelia* and *Nessaea*, the rami appear as a derivative character hypandrium (JENKINS, 1984, 1985a, b, 1986, 1987, 1989, 1990). The hypandrium with bilateral projections forming the rami is an autapomorphy of *Hamadryas* (GARZÓN-ORDUÑA, 2012); in the analyzed species, *Hamadryas amphinome*, the rami are bilateral projections derived from the hypandrium, well differentiated, hollow and covered with

spines. The other species did not present the same pattern, but *Catonephele numilia neogermanica* and *Ectima thecla lirina*, have similar projections, but not developed.

From the results obtained it becomes obvious that the morphological variations of the hypandrium were inadequate to support the tribes of Biblidinae, leading us to believe that other aspects should reveal more important characters for the group, as the venation for example. However, the great variability here highlighted can be very useful to diagnose genera and species, therefore, we suggest that the morphological variation of this sclerite should also be observed inside the genera and in a phylogenetic context, in order to understand, in a concrete way, how this structure can be important for the identification and understanding of the evolution of these butterflies.

The function of the hypandrium has not been addressed in any prior studies, however it is believed to be an auxiliary structure in mating, to support the male genitalia and often having additional structures which possibly hold the female during mating as the rami and other projections. Moreover, ZUBEK *et al.* (2015) suggested an apparent coevolution of the male hypandrium and the female antevaginal lamella, possibly related to their function during mating in *Perisama bleuzeni* Attal & Crosson du Cormier, 1996 and *Perisama oppelii* (Latreille, [1809]). Further studies also are needed to better understand its variation and function in different groups of Biblidinae.

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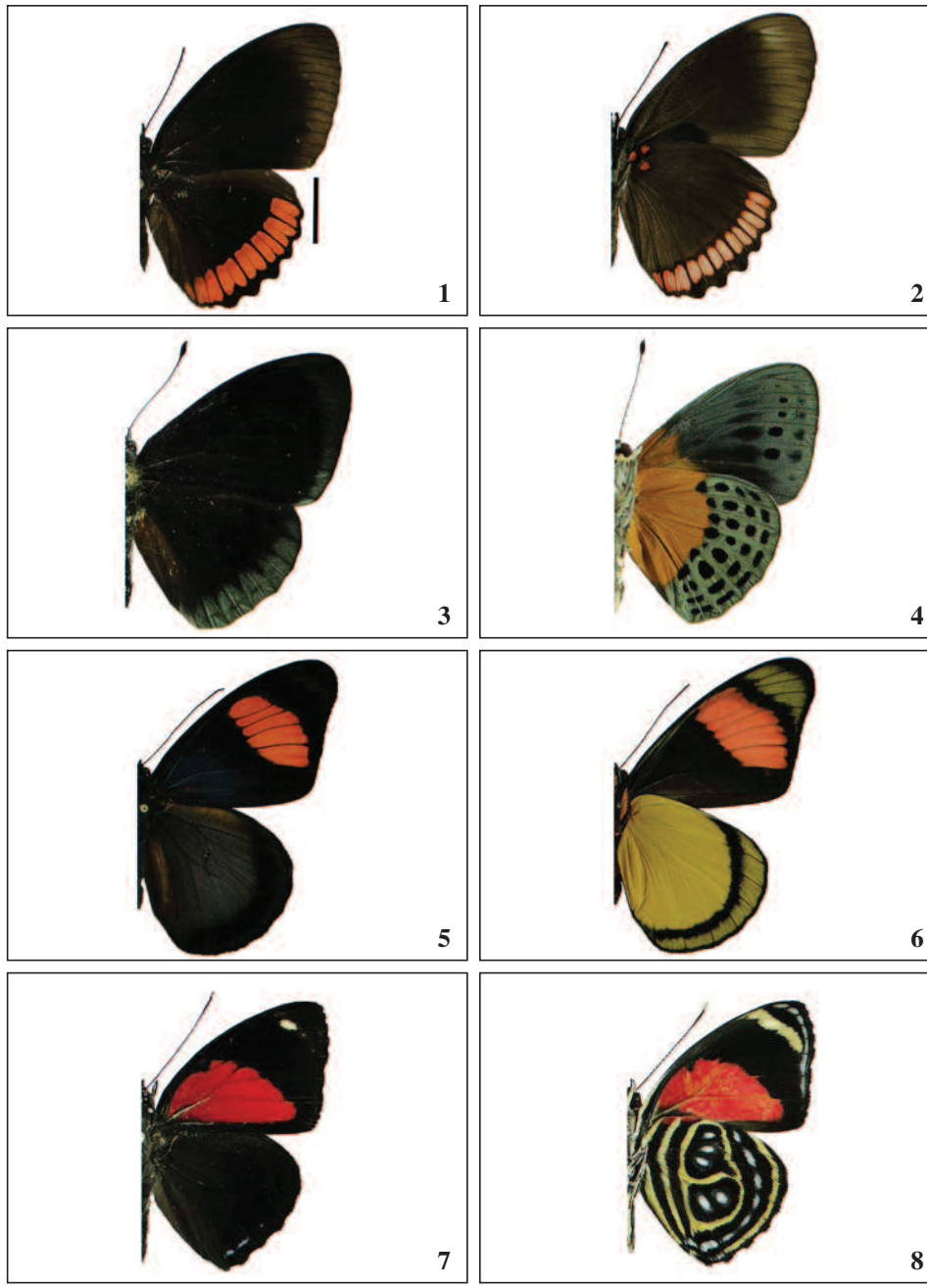

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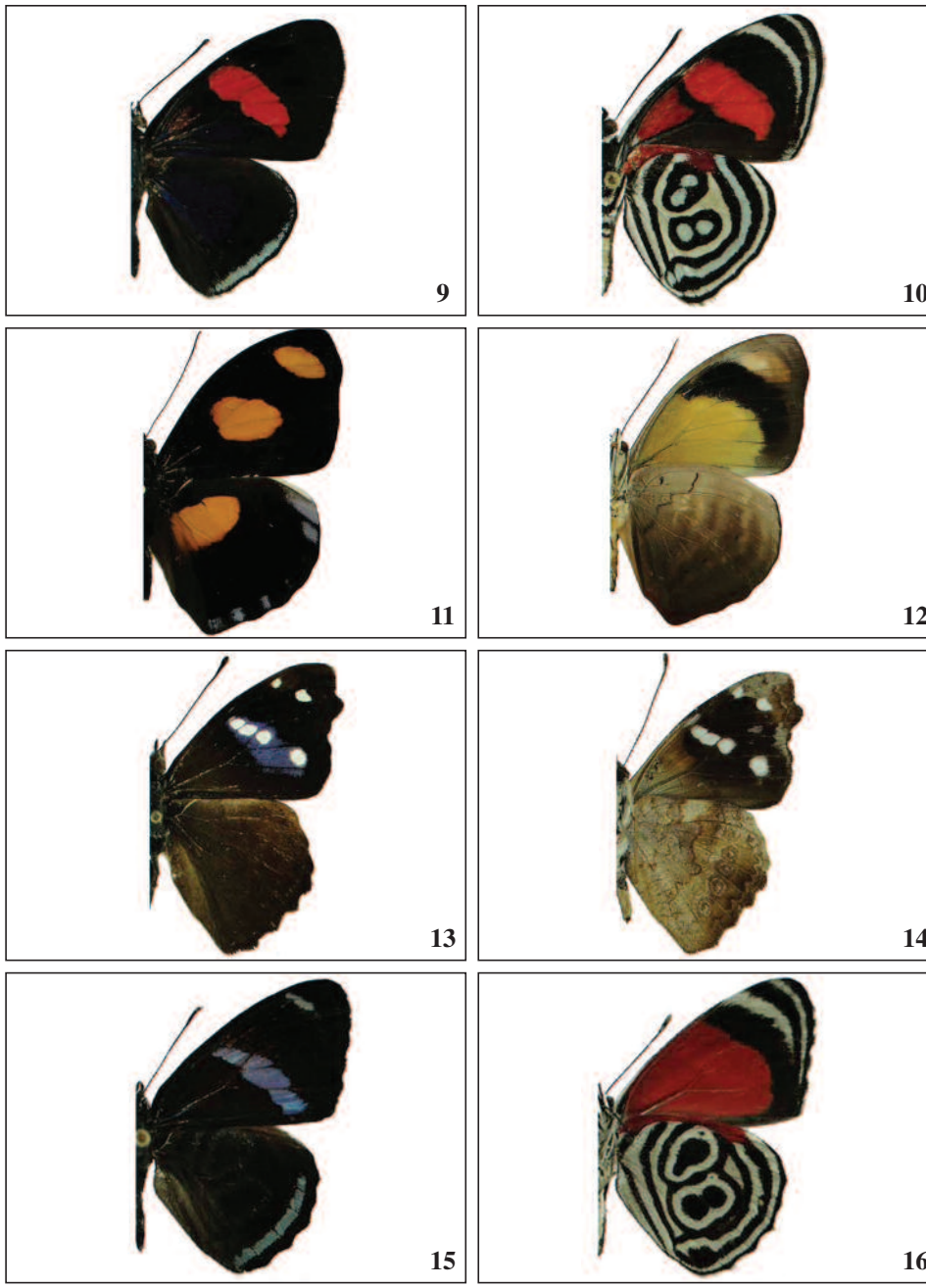

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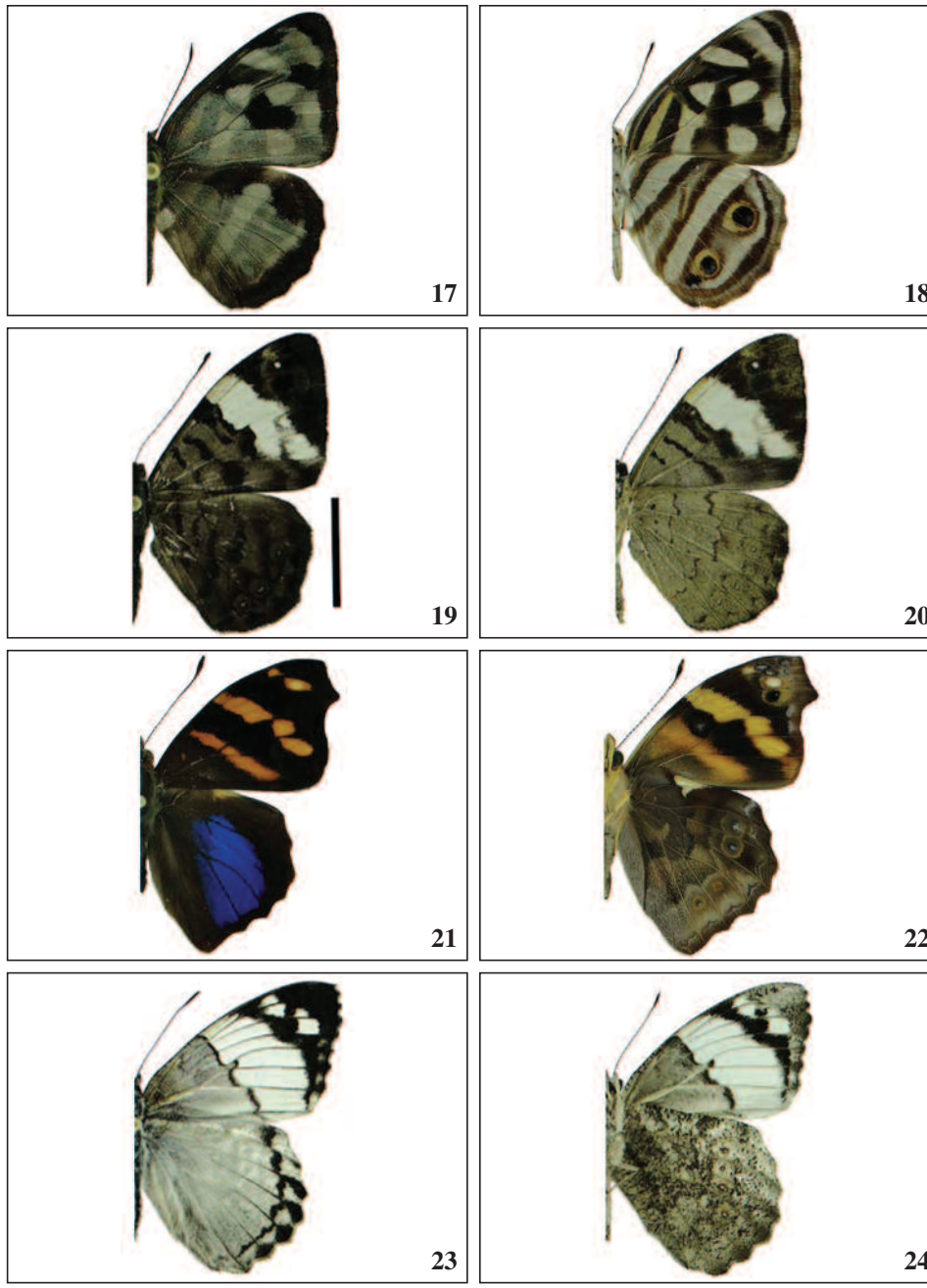

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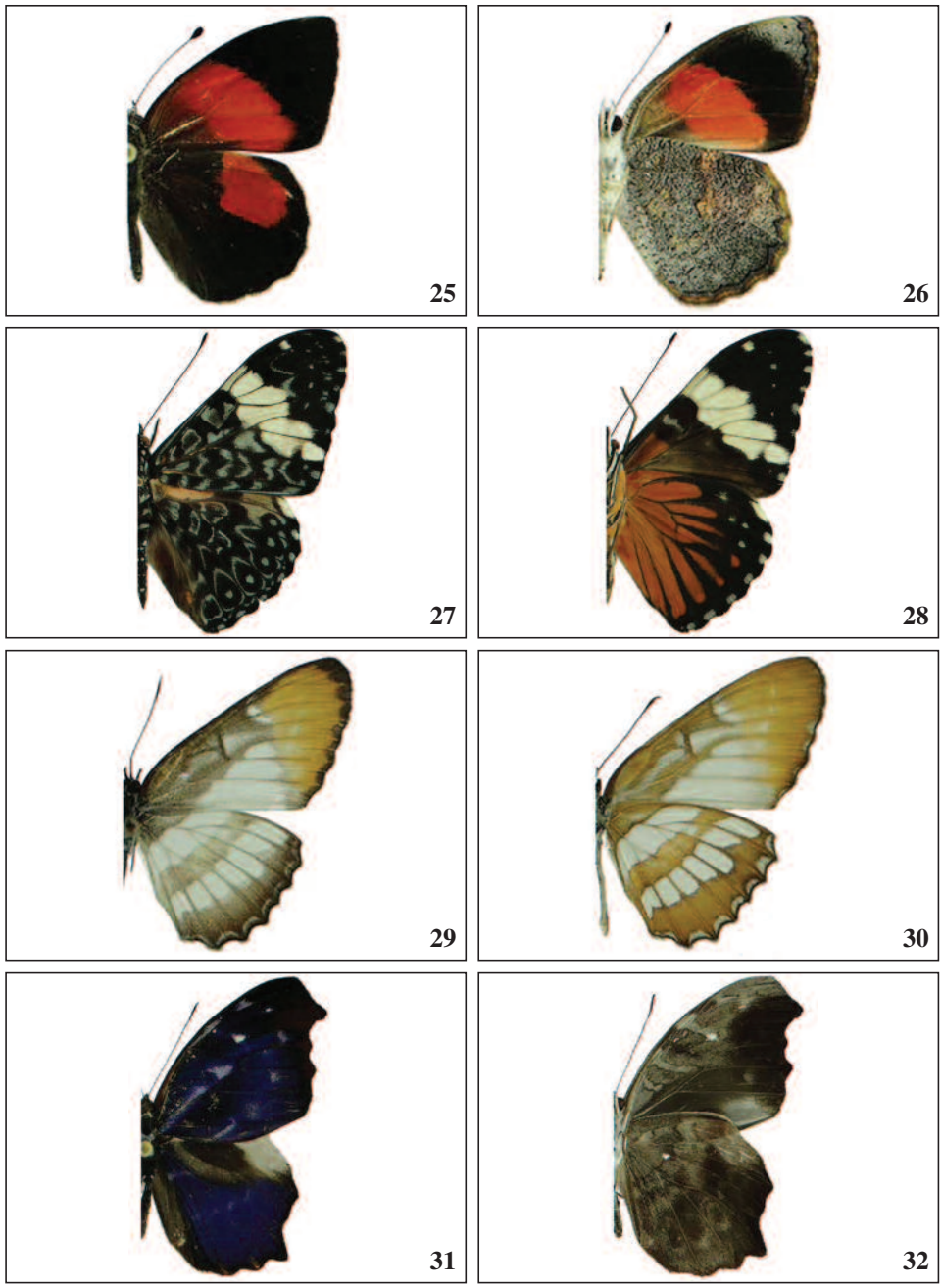

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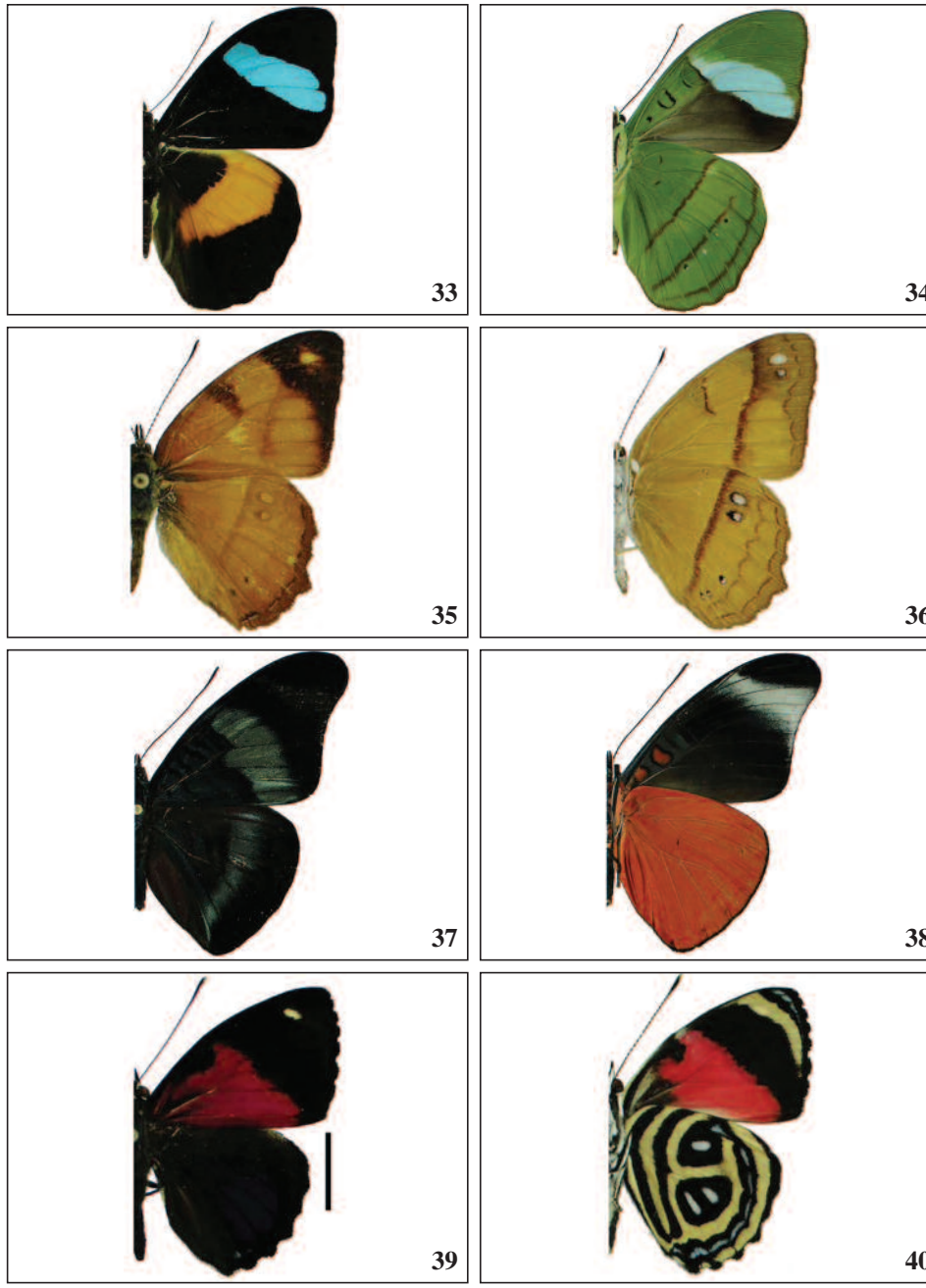

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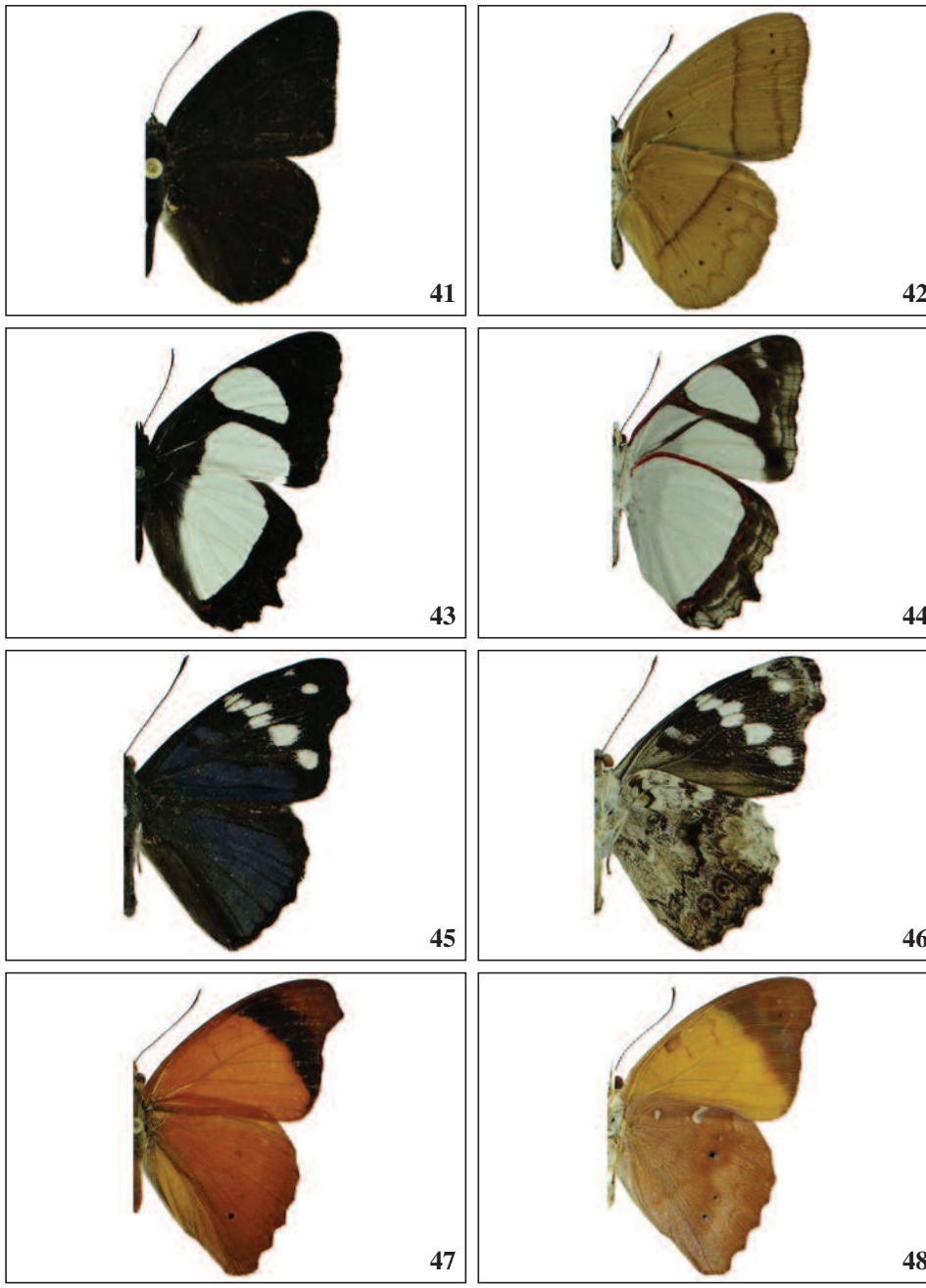

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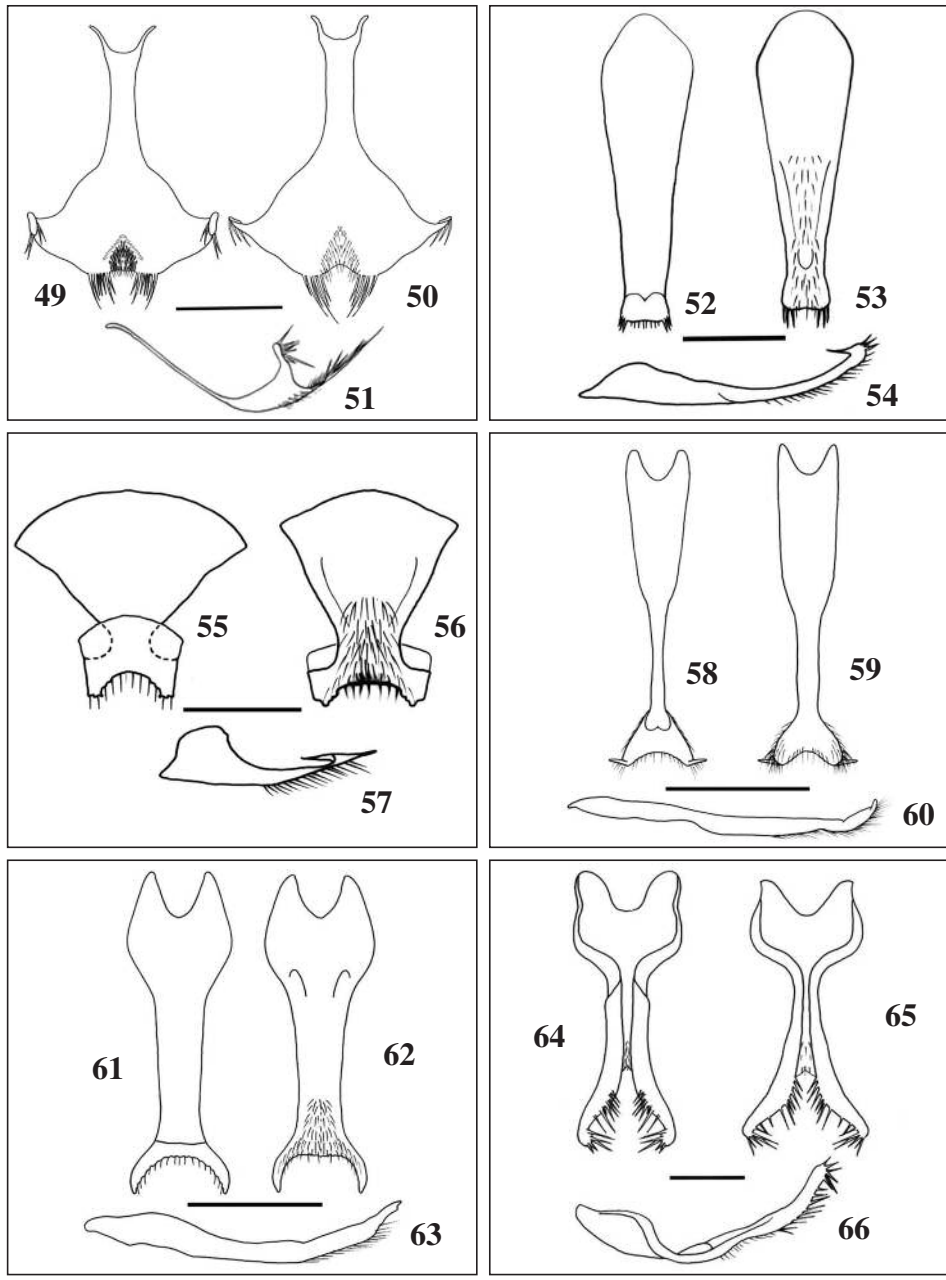

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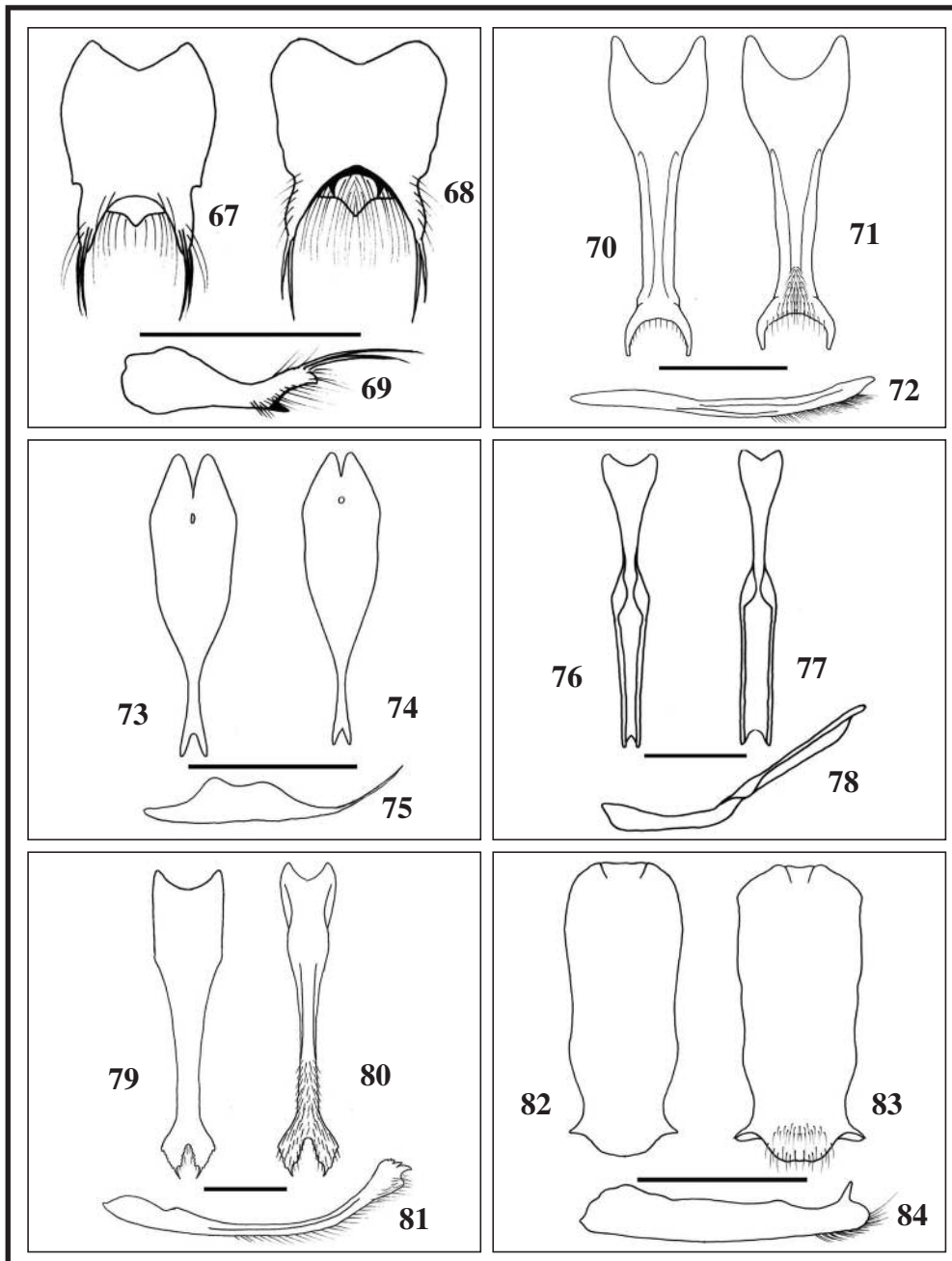

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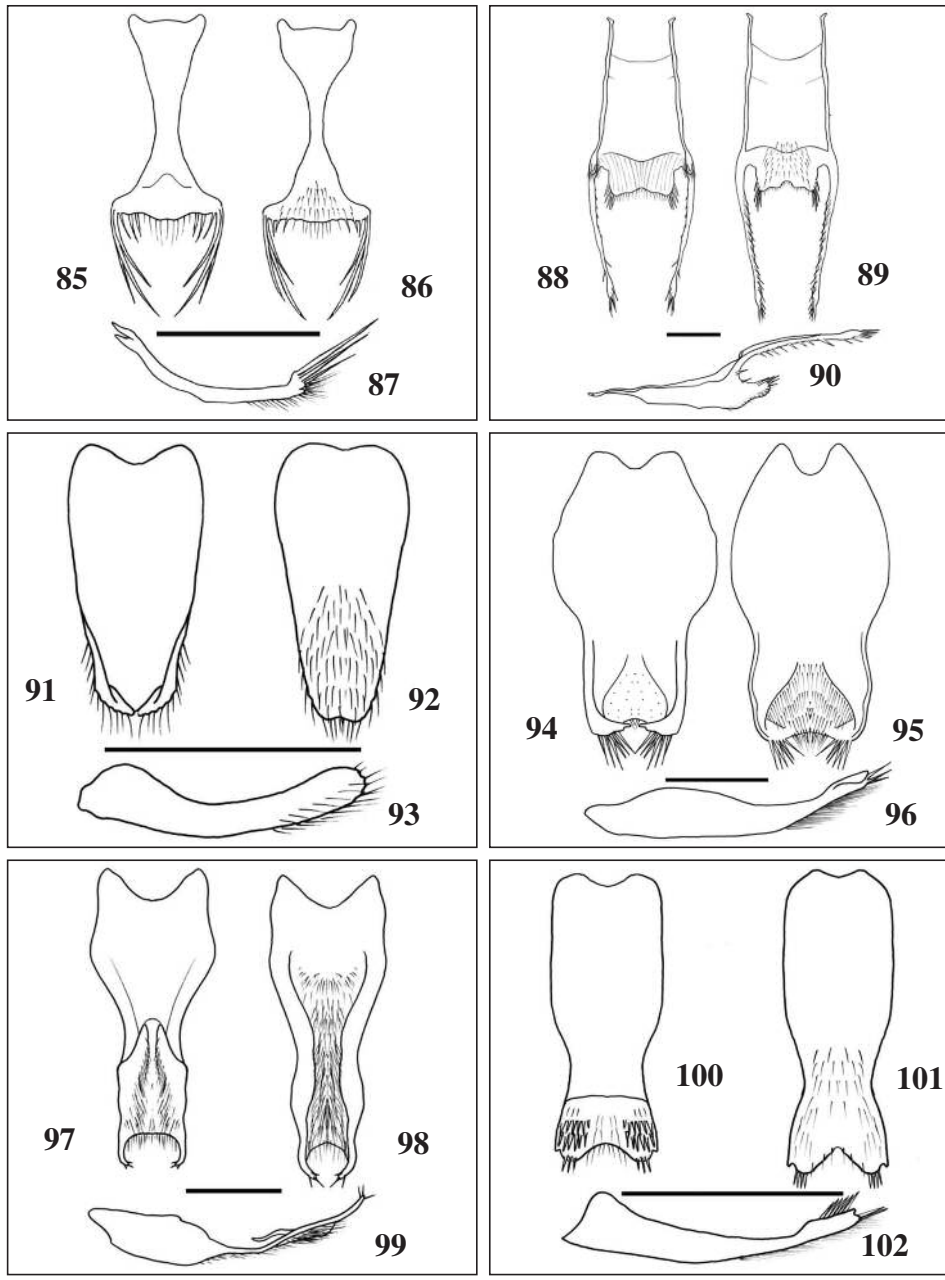

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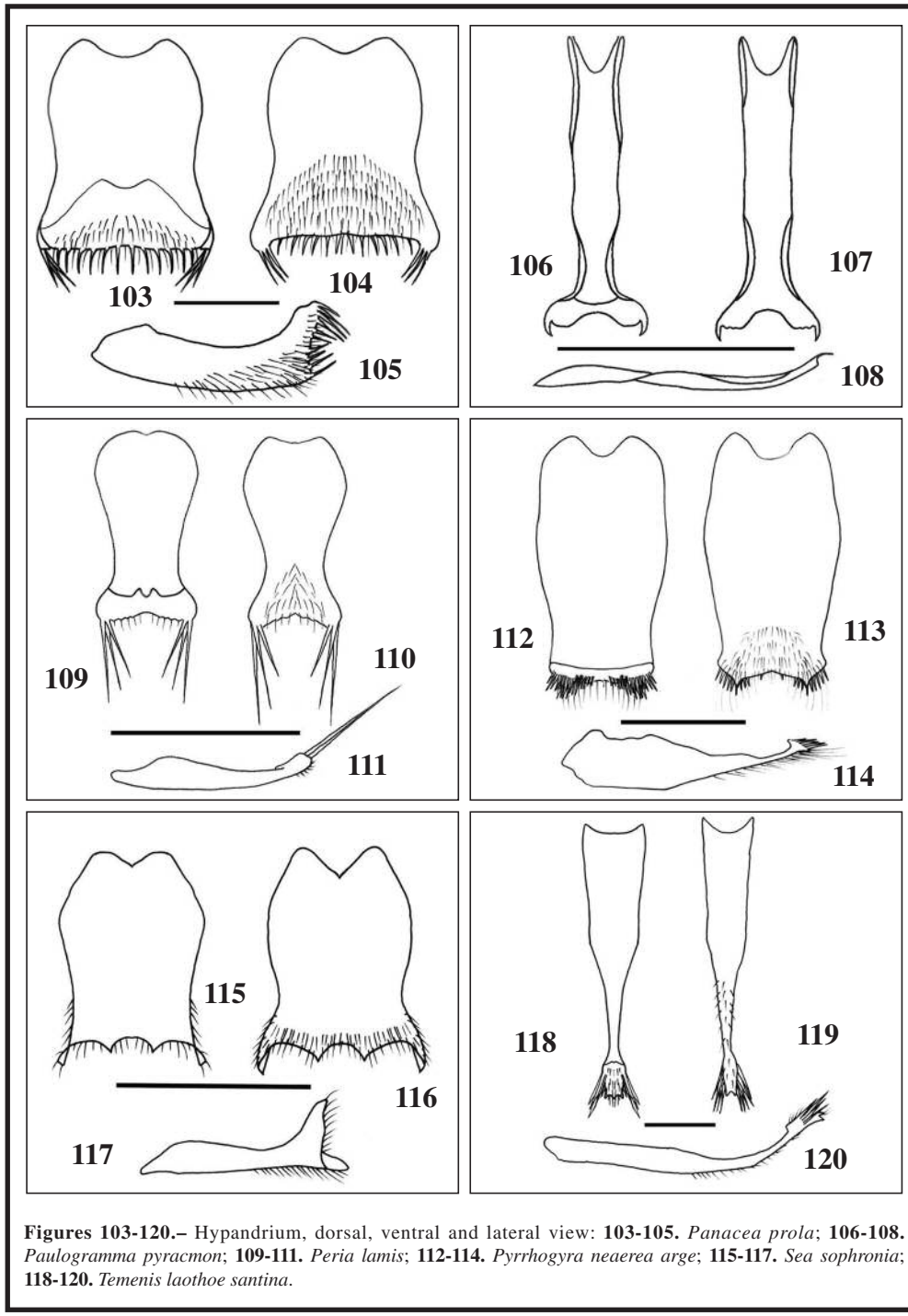

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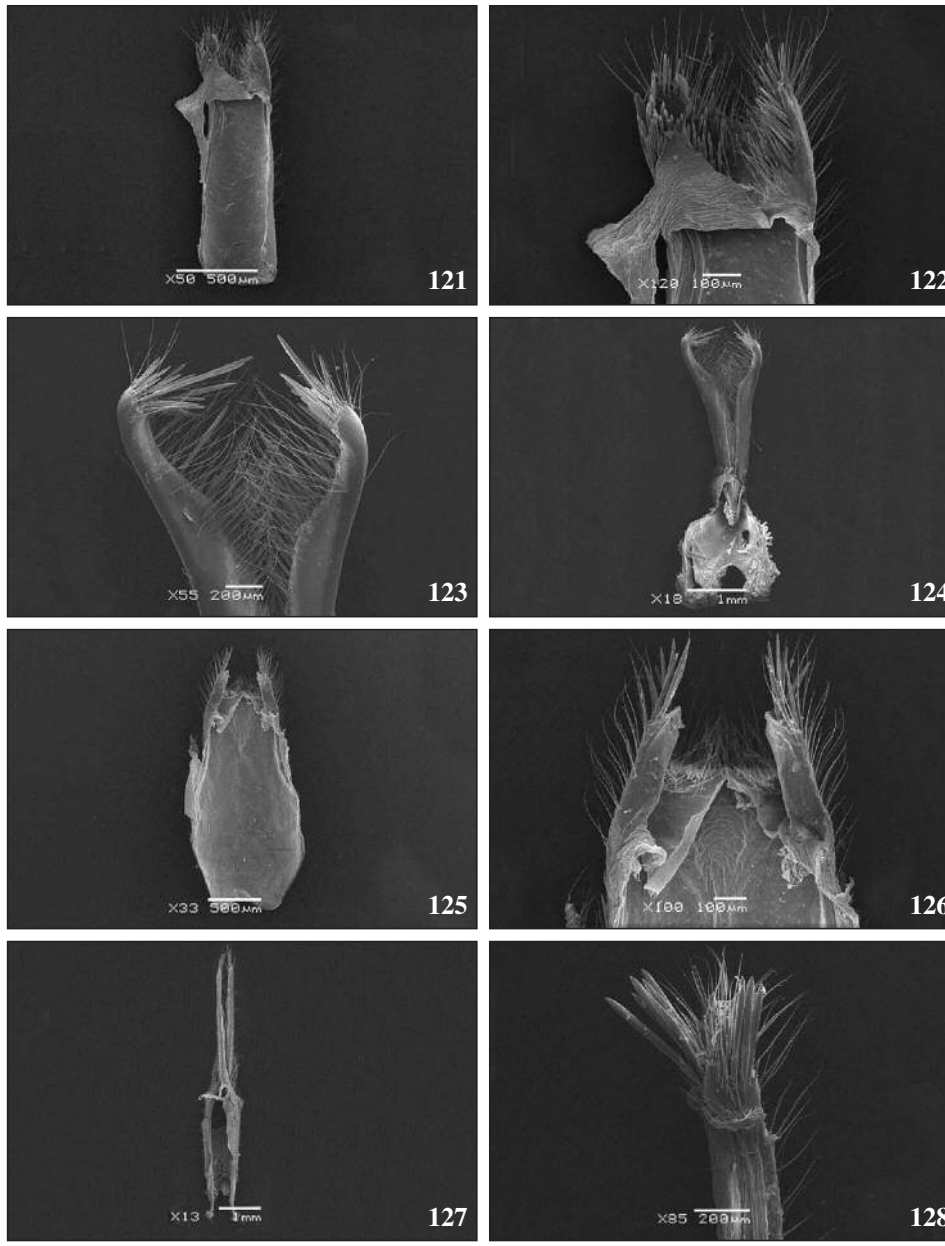

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