Zootaxa 1415: 35–42 (2007)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Two new genera in the Nymphidiina (Lepidoptera: Riodinidae: Nymphidiini)

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Abstract

Two new riodinid genera in the subtribe Nymphidiina (tribe Nymphidiini) are described from the lowlands of the Amazon basin. *Livendula* Hall, n. gen., is described with *huebneri* Butler as its type species, and the following eleven species are transferred to *Livendula* (n. combs.) from *Adelotypa* Warren: *amasis* Hewitson, *aminias* Hewitson, *aristus* Stoll, *balista* Hewitson, *epixanthe* Stichel, *huebneri* Butler, *jasonhalli* Brévignon & Gallard, *leucocyana* Geyer, *leucophaea* Hübner, *pauxilla* Stichel, and *violacea* Butler. *Minotauros* Hall, n. gen., is described with *lampros* Bates as its type species, and the following two species are transferred to *Minotauros* (n. combs.) from *Adelotypa*: *lampros* Bates, and *charessa* Stichel.

Key words: *Adelotypa*, Amazon, morphology, Nymphidiini, taxonomy

Introduction

The purpose of this paper is to describe two new Amazonian riodinid genera in the subtribe Nymphidiina, one of four subtribes in the large riodinine tribe Nymphidiini (Hall, 1999, 2002; Hall & Harvey, 2002a; Callaghan & Lamas, 2004), for species that heretofore have been treated in *Adelotypa* Warren, 1895. The Nymphidiina is a sizeable group of over 150 species that has long represented one of the most taxonomically challenging in the whole family (Harvey, 1987). The task of crafting a comprehensive species-level phylogenetic revision and new generic classification for the subtribe is nearly complete (Hall, in prep.). However, to ensure that the manuscript names *Livendula* and *Minotauros*, which have been in wide circulation in the riodinid community for several years, receive nomenclatural recognition as soon as possible, I propose their names here, along with detailed generic descriptions and diagnoses. The comprehensive taxonomic revisions and phylogenetic hypotheses for these two genera will appear in my forthcoming monograph of the subtribe.

Livendula Hall, n. gen.

(Figs. 1A,B; 3; 5)

Type species: *Lemonias huebneri* Butler, 1867.

Etymology: The name of this genus is based on the medieval Latin word for lavender, and refers to the almost universal occurrence of this color on the dorsal wings of males in this genus.

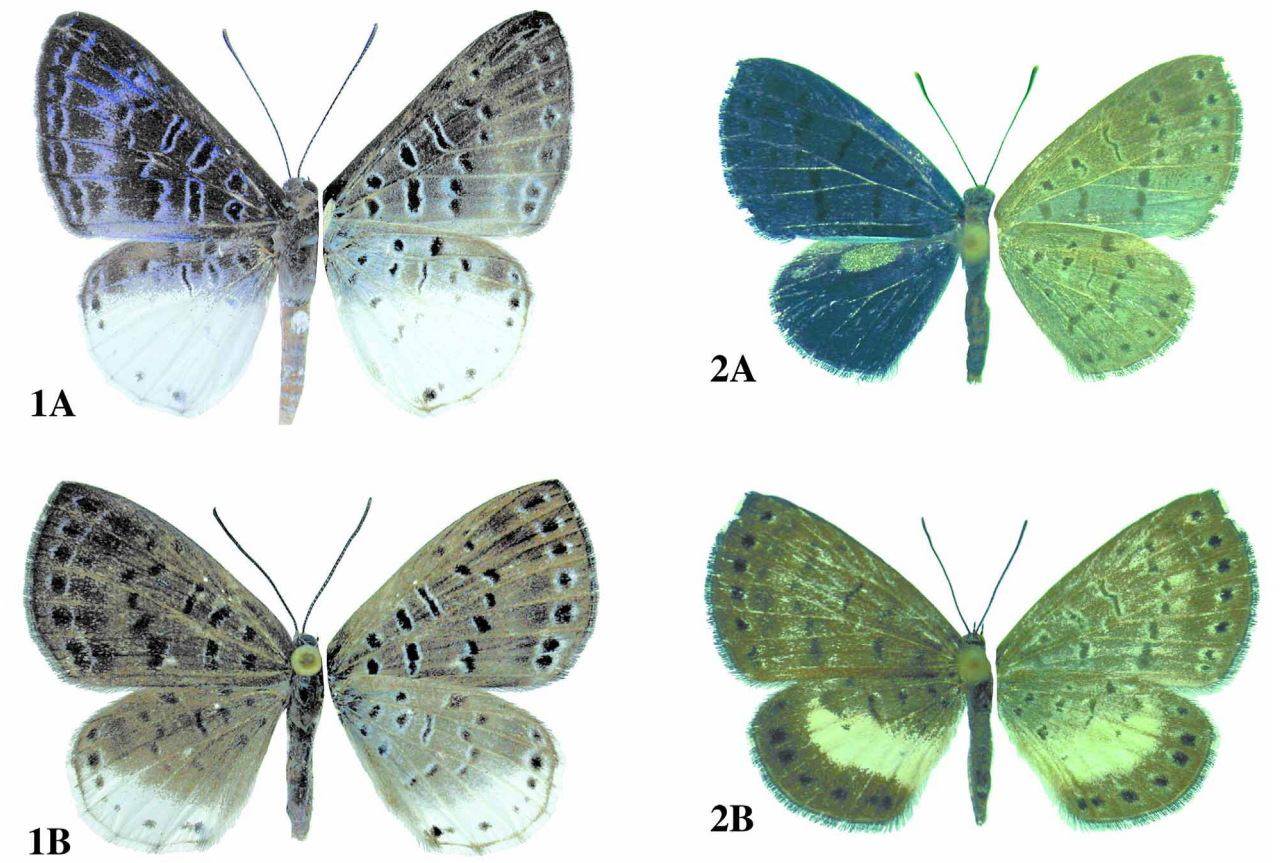
Description: MALE: Forewing length 11–19 mm. *Wing shape*: Both wings typically compact; forewing costa approximately straight, distal margin slightly convex, anal margin straight; hindwing rounded. *Venation*: As in *Adelotypa* (see Stichel (1910–11), under *Echenais* Hübner, [1819]), four forewing radial veins. *Dorsal surface*: Ground color of both wings brown or rufous brown; three black spots in discal cell of both wings and two at base of cell Cu_2, an additional spot at base of cell Rs on hindwing, all of these encircled with lavender

Accepted by R. Robbins: 8 Jan. 2007; published: 5 Mar. 2007

scaling in most species; jagged postdiscal band of black spots on both wings usually associated with variably prominent proximal and distal lavender scaling, a broad white postdiscal band present on both wings in one species (*L. amasis* (Hewitson, 1870)), a variably broad distal white patch on hindwing extending to distal margin present in all derived species; dark submarginal spots faint to absent within hindwing white areas, but prominent elsewhere and almost always encircled with lavender scaling; forewing fringe either brown or with variably prominent white elements in cells Cu_2, M_3, M_1 and R_{4+5}, hindwing fringe either brown or checkered brown and white. *Ventral surface*: Differs from dorsal surface in following ways: Ground color of both wings pale to medium brown; dorsal lavender scaling replaced by whitish scaling of somewhat similar extent; whitish scaling surrounds basal spots in all species, all black spots more prominent.

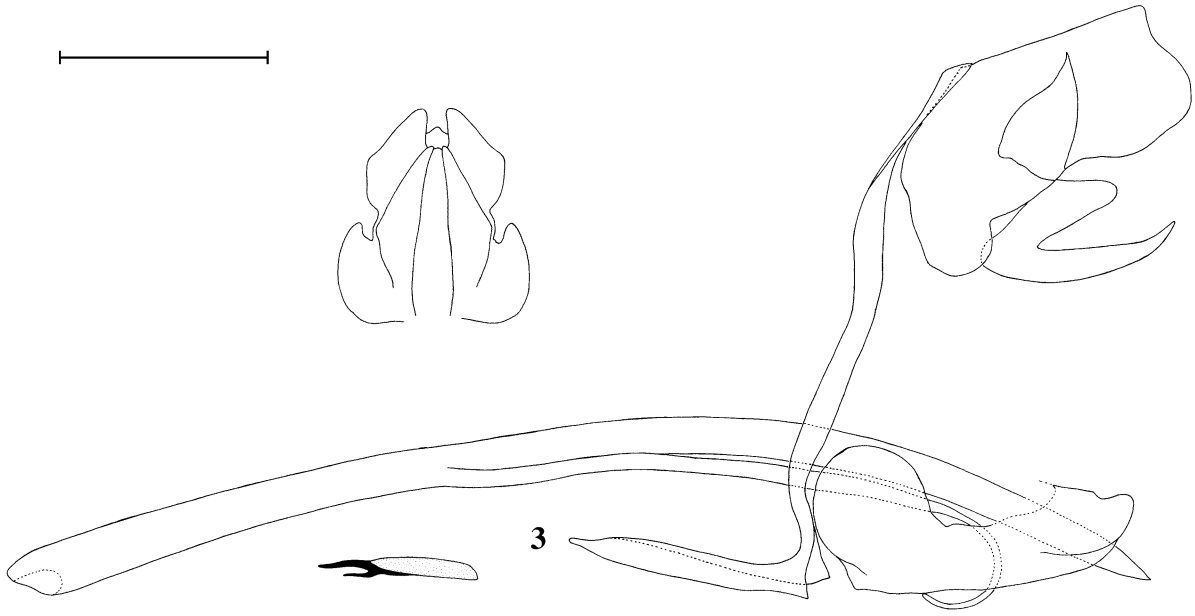
Head: Ventral surface of labial palpi generally a mixture of pale white or pale yellow-brown and dark scaling, dorsal surface dark brown, second and third segments elongate; eyes brown and bare, with white or pale brown scaling at margins; frons brown with a thin vertical band of white or pale brown scaling laterally and a broad horizontal pale band ventrally; antennal length approximately 60 to 70% of forewing length, segments brown with an elongate band of white lateral scaling, nudum along inner ventral margin of shaft variably narrow and discontinuous; clubs black, tips orange brown.

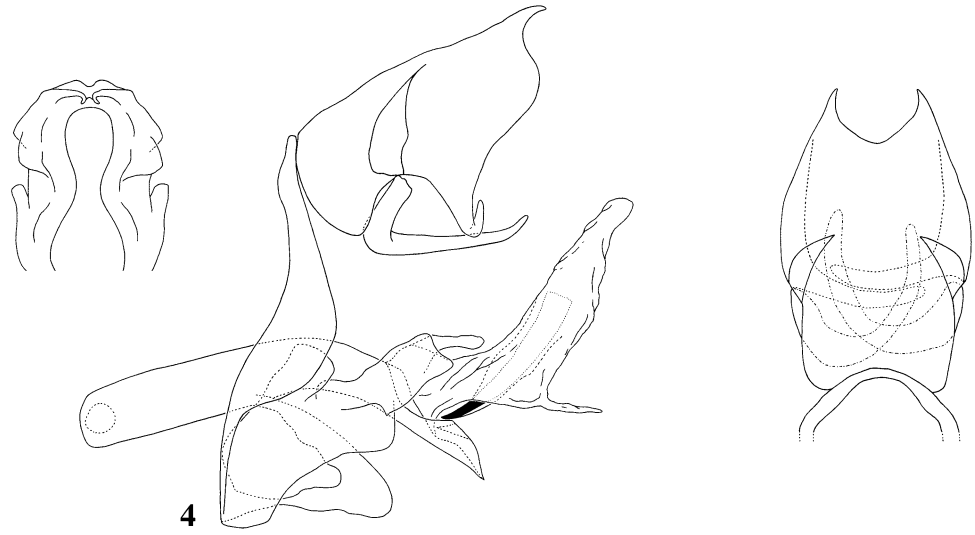
Body: Dorsal surface of thorax and abdomen dark brown, ventral surface pale brown to whitish; eighth sternite a simple rectangle with a smoothly rounded posterior margin; all legs pale brown or whitish, tarsus of foreleg unimerous, coxa of medium length for family, midleg and hindleg with a tibial spur and a group of spines at inner distal tip of tibia and spines along inner margin of all tarsal segments.



FIGURES 1–2. Adults (dorsal surface on left, ventral surface on right). **1A**. *Livendula huebneri* male, nr. Cacaulândia, S.W. Brazil [Ro] (USNM). **1B**. *Livendula huebneri* female, nr. Cacaulândia, S.W. Brazil [Ro] (USNM). **2A**. *Minotauros lampros* male, Estación Científica Yasuní, E. Ecuador (JHKW). **2B**. *Minotauros lampros* female, Estación Científica Yasuní, E. Ecuador (JHKW).

Genitalia (Fig. 3): Uncus in lateral view approximately rectangular and typically more posteriorly elongate ventrally, with a broad and shallow dorsal indentation medially, lateral "window" dorsally separated in all species except *L. balista* (Hewitson, 1863); falces broad; vinculum slightly sinuate and approximately even in width, saccus elongate; valvae in lateral view approximately rectangular, with a rounded lateral bulge basally, an angular anteroventral margin, a dorsal desclerotized region medially, and two inwardly and upwardly curved, rounded processes posteriorly that are most readily visible as separate valve elements in ventral view, upper process broader and slightly more posteriorly elongate, valvae fused dorsally near tips with a broad and slightly medially raised sclerotized band; aedeagus very long and narrow, with pointed posterior tip opening dorsally or to right, and rounded anterior end opening anteroventrally and slightly to right; everted vesica very long and narrow, with a large and narrow "pitch-fork"-shaped cornutus positioned in middle section of vesica consisting of a long and thick dorsal spine and a shorter and narrower ventral spine attached to a more weakly sclerotized, flattened and approximately rectangular pad, and a small membranous tube exiting laterally from main stem of vesica near anterior tip of cornutus; very long and narrow, strap-like pedicel joins aedeagus in its anterior half.





FIGURES 3–4. Male genitalia. **3**. *Livendula huebneri*, Matoury, French Guiana (USNM), with genitalia and cornutus (bottom) in lateral view, and valvae in ventral view (top). **4**. *Minotauros lampros*, upper Río Tiputini, E. Ecuador (JHKW), with genitalia in lateral view, valvae in ventral view (left) and uncus/tegumen in dorsal view (right). Scale bar = 1 mm.

FEMALE: Differs externally from male in following ways: Forewing length 12–20 mm; both wings more rounded; both wing surfaces paler plain brown, dorsal lavender scaling confined to submargin in most species, with derived species only having lavender scaling encircling basal spots; white hindwing patch in female not necessarily correlated with its presence in male, and when present smaller in extent than in male; one species with a white postdiscal band on forewing (*L. violacea* (Butler, 1867)), another with a white postdiscal band on both wings (*L. amasis*).

Head: Second and third palpal segments slightly more elongate.

Body: Foreleg with spines at inner distal tip of tibia and tarsal segments one to four.

Genitalia (Fig. 5): Corpus bursae elongate and generally narrow, with a pair of medially to posteriorly positioned, variably small, spine-like signa in all species except one (*L. epixanthe* (Stichel, 1911)), which typically have an elongate and convex outer margin at wall of corpus; ductus bursae membranous and very elongate (often of equal length to entire abdomen), with an enlarged "half-moon"-shaped section in posterior half that is hardened and slightly darkened by a dense layer of tiny spines on inner surface; posterior portion of ductus bursae with a variably elongate, straight, sclerotized section, which is entirely sclerotized in vicinity of ostium bursae, but only sclerotized ventrally and laterally for most of its length; membranous ductus seminalis exits ductus bursae dorsally, in vicinity of sclerotized section; ostium bursae a large, triangular, sclerotized plate, with posterior apical portion variably projecting away from abdominal surface to form a sclerotized cone, ostium opening round and posteriorly positioned; papillae anales approximately rectangular.

History of classification: The first species to be described of those treated here in the new genus *Livendula* was *Papilio aristus* Stoll, 1790. All of the remaining species were described in *Lemonias* Hübner, 1807, *Echenais* and *Adelotypa*, almost entirely in that chronological order, predominantly by Hewitson, Butler and Stichel. It is a reflection of how common and widespread most *Livendula* species are that seven had been described by the time of Bates' early catalog (1868). All of the remainder, except one, the common yet overlooked species *L. jasonhalli* (Brévignon & Gallard, 1999), had been described by the time of Stichel's (1910–11) first catalog. Stichel (1910–11) treated all of the then described species except one in a single species group of *Echenais*, but he additionally included in that group species from several other genera. He erroneously treated *L. amasis* as a synonym of *Lemonias egaensis* (Butler, 1867), presumably because of the superficial similarity of the females. The arrangement in his second catalog (1930–31) was very similar, but *L. amasis* was transferred to *Echenais* as a good species, and *L. epixanthe* was also raised to species status. Stichel recognized seven and nine species, respectively, in these two catalogs. Through the nomenclatural action of Hemming (1943), all the species previously treated in *Echenais* became part of *Adelotypa*. Most recently, Callaghan & Lamas (2004) recognized thirteen species in the *Adelotypa aristus* group, unjustifiably treating *asemna* Stichel, 1910, and *mollis* Butler, 1877, as full species (Hall, in prep.). Eleven species are here recognized in *Livendula* (n. combs.) and transferred from *Adelotypa*: *amasis* (Hewitson, 1870), *aminias* (Hewitson, 1863), *aristus* (Stoll, 1790), *balista* (Hewitson, 1863), *epixanthe* (Stichel, 1911), *huebneri* (Butler, 1867), *jasonhalli* (Brévignon & Gallard, 1999), *leucocyana* (Geyer, 1837), *leucophaea* (Hübner, [1821]), *pauxilla* (Stichel, 1911), and *violacea* (Butler, 1867). A complete synonymic list of all *Livendula* names is given in my revision of the subtribe Nymphidiina (Hall, in prep.).

Diagnosis and systematic position: All members of *Livendula*, as well as *Minotauros* described below, possess dorsally fused valve tips and a ventrally positioned spiracle on male abdominal segment three, placing them in the nymphidiine subtribe Nymphidiina. *Livendula* contains many confusingly similar species, and the genital morphology, particularly of males, is very uniform across the group. The genus is characterized by the presence of variably extensive lavender scaling on the dorsal wings of males in all species except the basal *L. balista*, the possession in the male genitalia of all species of an extraordinarily long aedeagus and associated pedicel, a unique "pitch-fork"-shaped aedeagal cornutus, a very long saccus, and a unique valve shape, and the possession in the female genitalia of all species of a hardened "half-moon"-shaped swelling near the middle of the ductus bursae, presumably the location in which the male aedeagal cornutus fits during copulation.

Livendula species, as well as those of *Minotauros*, lack the characters possessed by members of the most derived Nymphidiina clades, such as asymmetrical valve tip lengths and an ancillary spine at the base of the aedeagal cornutus, placing the genus in the basal half of the subtribe (Hall, in prep.). There are no obvious synapomorphies uniting *Livendula* with any other genus, but the fact that the aedeagal vesica of species in both genera has an unusual membranous extension from the main tube in the vicinity of the cornuti, combined with similarities in wing pattern, suggests that *Livendula* and *Minotauros* are very close relatives.

Distribution: *Livendula* is entirely confined to South America east of the Andes, and ranges from Venezuela to Bolivia, Brazil, and the Guianas. It is possible that all eleven species might be found sympatrically in certain regions of western Amazonia.

***Minotauros* Hall, n. gen.**
(Figs. 2A,B; 4; 6)

Type species: *Lemonias lampros* Bates, 1868.

Etymology: The name of this genus is based on the monster from ancient Greek mythology with the head of a bull and the body of a man, in reference to the dorsally bifurcate male genital uncus of the type species.

Description: MALE: Forewing length 11–14 mm. *Wing shape*: Both wings slightly elongate; distal margin of forewing prominently convex, costal and anal margins slightly convex (anal margin of *M. lampros* curled in Fig. 2A); hindwing rounded. *Venation*: As in *Livendula,* four forewing radial veins. *Dorsal surface*: Ground color of both wings brown overlaid with dark blue scaling on both wings in *M. lampros*, and rufous-brown scaling on forewing and costal half of hindwing and white scaling on anal half of hindwing in *M. charessa* (Stichel, 1910); three black spots in discal cell of both wings, two black spots at base of cell Cu_2, jagged band of black postdiscal spots and smooth band of small black submarginal spots lined proximally with whitish scaling in *M. charessa*, postdiscal and basal spots on hindwing barely visible, all dorsal black spots more prominent in *M. charessa*; *M. lampros* with a well-defined, raised, oval pad of dark yellow androconial scales in middle of hindwing costal margin, and *M. charessa* with a more poorly defined patch of rufous-brown androconial scales in same position; forewing fringe brown, hindwing fringe brown in *M. lampros* and largely white in *M. charessa*. *Ventral surface*: Differs from dorsal surface in following ways: Ground color pale yellowish brown in *M. lampros*, and a paler version of dorsal surface in *M. charessa*; *M. charessa* with a poorly defined patch of rufous-brown androconial scales at middle of forewing anal margin; dark spots surrounded by yellowish scaling in *M. lampros* and whitish scaling in *M. charessa*, spots more prominent on both wings in *M. lampros* and on hindwing in *M. charessa*.

Head: Labial palpal segments yellow at base and brown distally in *M. lampros*, and pale brown dorsally and dark brown ventrally in *M. charessa*, second and third segments elongate; eyes brown and bare, with pale scaling at margins; frons brown with yellow scaling ventrally in *M. lampros*, and whitish scaling in *M. charessa*; antennal length approximately 60% of forewing length, segments brown with pale scaling at base, nudum along inner ventral margin of shaft prominent; clubs black, tips orange brown.

Body: Dorsal surface of thorax and abdomen dark brown and ventral surface pale brown in *M. lampros*, and dorsal surface of thorax rufous brown and ventral surface pale brown in *M. charessa* (removed abdomen of unique holotype was probably white); eighth sternite of *M. lampros* a simple rectangle with a very small distal indentation (eighth sternite shape in *M. charessa* unknown); all legs brown with yellow scaling in *M. lampros*, and whitish in *M. charessa*, tarsus of foreleg unimerous, coxa of medium length for family, midleg and hindleg with a tibial spur and a group of spines at inner distal tip of tibia and spines along inner margin of all tarsal segments.

Genitalia (Fig. 4): Uncus in *M. lampros* approximately rectangular in lateral view, with a prominently bifurcate dorsal posterior margin and a pair of elongate, ventrally and inwardly directed projections at ventral margin, uncus in *M. charessa* plain and approximately rectangular in lateral view, lateral "window" dorsally separated; falces of average size and shape for family; vinculum sinuate and slightly enlarged medially, saccus absent; valvae narrow, elongate, and approximately rectangular, with an elongate basal lateral bulge, valvae fused dorsally at posterior tips, posterior tip of each valve in ventral view in *M. lampros* with a narrow and apically downturned process; aedeagus short and of medium width, with pointed posterior tip opening dorsally and to right, and rounded anterior end opening to right, lip of posterior tip curled to right in *M. lampros*; everted vesica of *M. lampros* short and broad, with one short membranous process at dorsal base of vesica and another more posteriorly at ventral margin, and a single long, ventrally directed, "blade"-like cornutus that projects away from membrane towards anterior tip, uneverted vesica of *M. charessa* (as illustrated by Stichel (1910–11)) with a continuous row of about eleven small cornuti and a single larger cornutus anteriorly; pedicel of *M. lampros* posteriorly elongate with sclerotized lateral margins, pedicel of *M. charessa* simple and strap-like.

FEMALE (*M. lampros* only): Differs externally from male in following ways: Both wings slightly more rounded; ground color of both wings pale and slightly rufous brown; a broad, cream colored, postdiscal band on hindwing extending from middle of anal margin to near apex crisply defined on dorsal surface and more diffusely defined on ventral surface; diffuse cream scaling present distal to postdiscal band on ventral forewing, yellow-white scaling in association with submarginal spots more prominent on both wings.

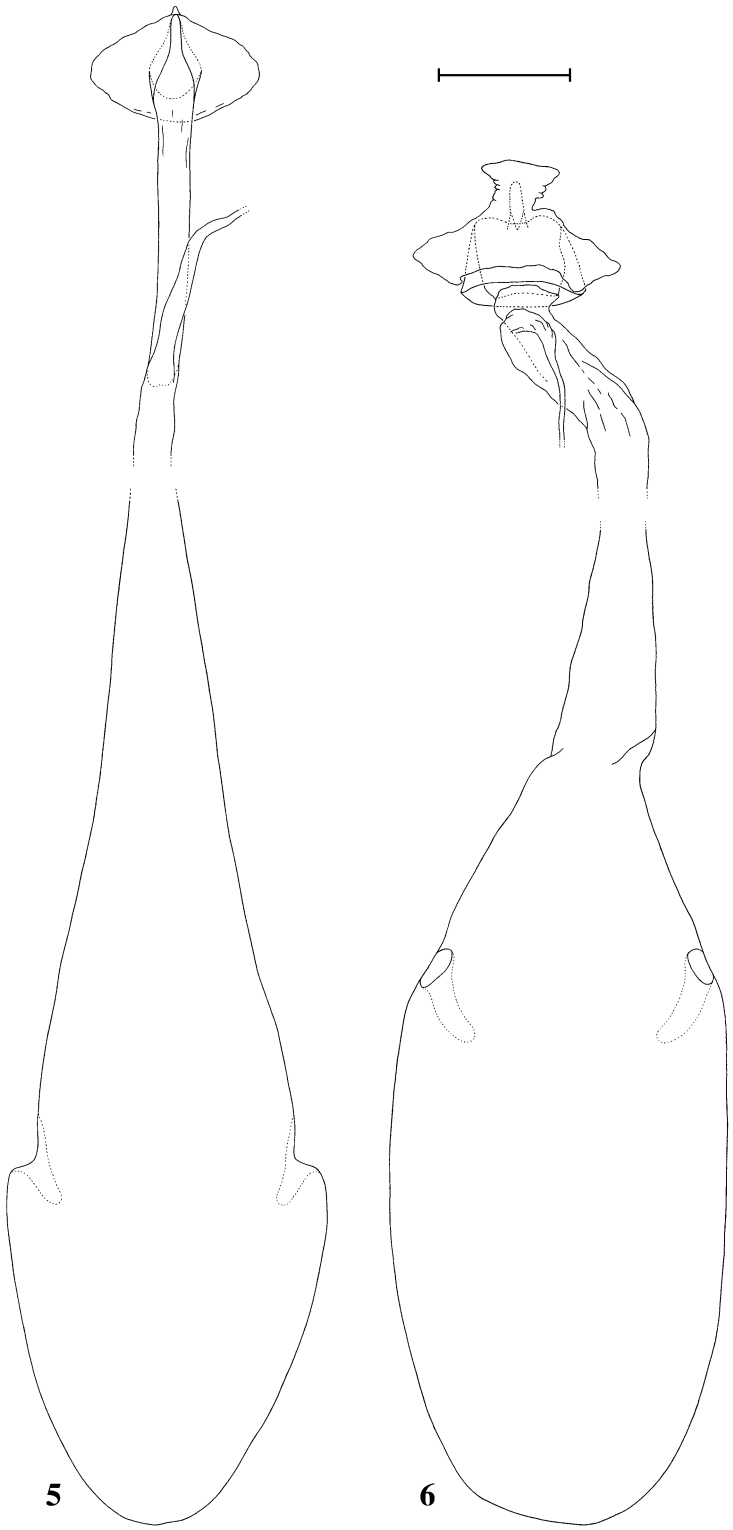
Head: Second and third palpal segments slightly more elongate.

Body: Foreleg with spines at inner distal tip of tibia and tarsal segments one to four.

Genitalia (Fig. 6): Corpus bursae elongate, with a pair of posteriorly positioned, medium-sized, spine-like signa; ductus bursae broad and membranous, with a short, broad and flattened sclerotized section at posterior tip; membranous ductus seminalis exits ductus bursae on dorsal right side immediately before sclerotized section; ostium bursae consists of a broad and flattened sclerotized section enveloping sclerotized section of ductus bursae, with a narrowly elongate and round-tipped sclerotized projection from middle of dorsal posterior margin, and an inverted "T"-shaped sclerotized pad on abdominal surface; papillae anales approximately rectangular.

History of classification: The two species placed here in this new genus were described in *Lemonias* and *Echenais*, and treated in two different species groups of *Echenais* by Stichel (1910–11, 1930–31). Not previously recognized as being close relatives, *lampros* Bates, 1868, and *charessa* Stichel, 1910, are here transferred to *Minotauros* (n. combs.) from *Adelotypa*. The female of *M. charessa* remains unknown, whilst the female of *M. lampros* was only recently discovered, and is associated with the male for the first time here.

Diagnosis and systematic position: The genus *Minotauros* is erected here primarily for *lampros*, and the placement of *charessa* in *Minotauros* can only be tentative at the present time. In a family that is full of extraordinary rarities, *M. charessa* is one of the most poorly known species. It was described nearly a hundred years ago from a single male specimen collected on the Rio Juruá in western Brazil (Stichel, 1910), and to my knowledge has never been collected again. In addition, the abdomen of the holotype, housed in the Zoologisches Museum of the Humboldt Universität, in Berlin, Germany (ZMHU), was long ago removed for dissection, and may well be lost. Despite repeated searches of the ZMHU by myself and museum staff, no trace of the genitalia dissection has ever been found. Although the male genitalia of the holotype were, very unusually, illustrated by Stichel (1910–11), his illustration is somewhat stylized and almost certainly not entirely accurate. As a consequence, knowledge of the genital morphology of *M. charessa* remains incomplete. Stichel's illustration does indicate the presence of numerous small cornuti in the uneverted vesica, and a small process on the valvae that are not present in *M. lampros*. The wing coloration of *M. charessa* also differs from that of *M. lampros*, but because *M. charessa* shares several unusual wing characters with *M. lampros*, I place it for now in *Minotauros*.



FIGURES 5–6. Female genitalia in dorsal view. **5**. *Livendula huebneri*, Parque Nacional Manu, Pakitza, Peru (USNM). **6**. *Minotauros lampros*, Mitú, Colombia (AME). Scale bar = 1 mm.

Minotauros lampros possesses numerous unique apomorphies, including a dark royal blue dorsal wing pattern, a prominent raised pad of yellow androconial scales across the middle of the costal margin on the dorsal hindwing (ultrastructure illustrated by Hall & Harvey (2002b)), a prominently bifurcate posterior margin to the uncus, a pair of elongate, ventrally and inwardly directed projections at the ventral margin of the uncus,

a unique valve shape, a laterally curled posterior lip to the aedeagus, a very large, blade-like aedeagal cornutus, a posteriorly projecting and laterally thickened pedicel, and a unique arrangement of sclerotized structures in the vicinity of the female genital ostium bursae. *Minotauros lampros* and *M. charessa* have very similar wing shapes and spotting patterns on both wings, and share a convex forewing anal margin, which is found elsewhere in the Nymphidiina only in the unrelated "*Setabis*" *tapaja* (Saunders, 1859) and an undescribed relative. They also share a prominently visible patch of androconial scales along the costal margin of the dorsal hindwing, which is found elsewhere in the Nymphidiina only in the unrelated *Pandemos pasiphae* (Cramer, 1775). As outlined in the diagnosis for *Livendula*, the species of *Minotauros* appear to be most closely related to those of *Livendula*.

Distribution: Both species of *Minotauros* appear to be largely confined to the lowlands of the western Amazon, with an outlying record of *M. lampros* from the mountains of southern Guyana.

Acknowledgments

I thank the National Geographic Society (R&I Grant #5751-96) and the National Science Foundation (BS&I Grant [DEB] #0103746) for the financial support of field and museum research; the many curators in Europe and the Americas for allowing me to examine the collections under their care; the Museo Ecuatoriano de Ciencias Naturales and the Ministerio del Ambiente, in Quito, Ecuador, for assisting with the procurement of collecting and export permits; and three anonymous reviewers for helpful comments on the manuscript.

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