Systematics, Morphology and Biogeography

Taxonomic review of *Gallio* Evans, 1955 (*Lepidoptera, Hesperiidae, Hesperiinae*): one less monotypic genus of Moncini

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**ABSTRACT**

Moncini is the tribe of *Hesperiidae* that comprises the greatest diversity of small, brown, hard to identify skippers. The group is peculiarly classified as having many monotypic genera, thus offering low informative value to its systematics. This study presents a review of the genus *Gallio* Evans, 1955, a genus formerly recognized as monotypic, and describes three new species, *Gallio imperatriz* sp. nov. from Maranhão, Brazil, *Gallio furtada* sp. nov. from Mato Grosso, Brazil and *Gallio eti* sp. nov. from Madre de Deus, Peru and Acre, Brazil (type locality). A lectotype for *Vehilis carasta* Schaus, 1902 is designated. *Gallio* is therefore redescribed and illustrations and diagnosis to its species are provided.

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**Introduction**

Moncini comprises the greatest diversity of small, brown, and unmarked Neotropical skippers, whose systematics is largely unknown (Burns, 1994; Warren et al., 2009). In this group, a substantial number of genera are monotypic (Evans, 1955; Burns, 1994; Austin, 1997; Turland et al., 2012), especially because male genitalia morphology can be very distinct from all other known genitalia.

These particular monospecific combinations may arise from two distinct taxonomic artifacts: (1) although recently investigated, many genera and species still lack figured genitalia, thus making comparisons much more challenging when describing new taxa; (2) some of these monospecific genera might include other species, though they are not yet described. This last case seems to be the reason why *Gallio* Evans, 1955 includes only a single species *Gallio carasta* (Schaus, 1902). In the present study, the genus is redescribed with remarks on its systematics and three new species are described.

**Methods**

The specimens of *Gallio* used in this study are deposited in: DZUP (Colecção Pe Jesus Santiago Moura, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil), MUSM (Museo de Historia Natural, Universidad Mayor de San Marcos, Lima, Peru), and OM (Olaf Mielke collection, Curitiba, Brazil), the abbreviation DZ corresponds to the code number of the specimens in DZUP collection. Genitalia of both sexes were prepared with standardized methods and illustrated (scales sizes 1 mm). Morphological terminology used follows Carneiro et al. (2012, 2013). Wings abbreviations are: DFW, dorsal forewing; DHW, dorsal hindwing; VFV, ventral forewing; VHV, ventral hindwing. Size is given as the forewing length from base to apex. The labels of the type material were described separately by a “/” and additional information is given between “[“]. Roman numbers in geographical distribution and phenology section state the month of specimen capture. In view of the similarity in general morphological pattern between all species belonging to *Gallio*, a detailed description is given for the genus and only exclusive characters are mentioned in the description of the new species.

**Results**

*Gallio* Evans, 1955

**Type species:** *Stomyles gallio* Mabille, 1904, by original designation.


Diagnosis. The genus Gallio is distinguished from almost all genera of Moncini by the presence of a unique color ventral wing pattern composed by a continuous yellowish marginal line with thin parallel expansions between veins until or before the discal spots from R₃–R₄ to Cuₐ₁–Cu₂₃ in VFW and from Sc + R₁ to M₂–Cu₂ in VHW. Additionally, VFW presents a row of small yellowish discal spots in each space from Sc to Cu₂₃ (poorly defined in DFW) and a yellowish discal spot in the anterior half of the discal cell (sometimes observable in DFW) while in VHW the row of small yellowish discal spots is present from Sc + R₁ to 2A (absent in DHW) and the yellowish discal spot occur at the posterior half of the discal cell (Figs. 1–4).

Only two species of the genus Vehilius Godman, 1910, plus the monotypic genus Ingloitus Austin, 1997 share the above characters with Gallio: Vehilius maditus Bell, 1941, Vehilius seriatus Mabille, 1891 and Ingloitus medicus Austin, 1997. The genus Gallio can be easily distinguished from those species belonging to Vehilius by the absence of a long patch of ochre hair-like scales at the base of the males DFVW anal margin. On the other hand, the wing pattern of Gallio is most similar to Ingloitus. However, the male genitalia in these genera differ in respect to four characters. The shorter anterior projection of saccus than the tegumen + uncus, uncus longer than wide, with its median distal projection as long as the uncus’ arms and the harpe distally long in Ingloitus (Austin, 1997, Fig. 12) may be used to distinguish these two genera.

Description: Antenna longer than one half of costa; antennal club short (equal to ¼ of the shaft); shaft ventrally yellowish; nubum from 10 to 12 segments, only on apiculus. Palpus quadrate (inner edge equal to the transverse width), ventrally yellowish to whitish mixed with brown scales, third segment cylindrical, thin, around half of the second segment length. Wings: forewing length: 9–13 mm. Ground color brown, violet bluish metallic shade on subapical area of VFW and on all VHW, and with yellowish markings. DFW uniformly brown; yellowish discal cell spot in the anterior half of the discal cell; a row of small yellowish discal spots in each space from Sc to Cu₂₃, sometimes faint or absent; brand absent. DHW uniformly brown. VFVW costal area yellowish from base to Sc end; yellowish discal cell spot at the anterior half of the discal cell; a row of small yellowish discal spots in each space from Sc to Cu₂₃; submarginal area with a continuous yellowish line with thin expansions parallel to the veins until or before reach the discal spots from R₃–R₄ to Cu₁₃–Cu₂₃; a whitish long spot in Cu₂₃–2A, aligned with the discal cell end. VFW costal margin yellowish; yellowish discal cell spot in the posterior half of the discal cell; a row of small yellowish discal spots in each space from Sc + R₁ to 2A; submarginal area with a continuous yellowish line with thin expansions parallels to the veins until or before reach the discal spots from Sc + R₁ to M₂–Cu₂₃. Legs: laterally iridescent dark yellow, mesotibia covered by small spines and with a pair of distal spurs; metabasitibia with two pairs of spurs. Abdomen dorsally dark brown, ventrally cream, central longitudinal line thin, weak to absent; pleural spots between segments IV–VI absent on females. Male Genitalia: tegumen without projection; fenestra triangular, developed to reduced, wider than long. Saccus lobed, longer than tegumen + uncus. Uncus shorter than wide, with reduced projected arms, largely separated from each other and with the distal median projection shorter than the uncus arms’ length. Gnathos hooked-like, with a membranous patch. Valvae symmetrical, without posterior median cleft dividing ampulla from harpe; saccus rectangular; harpe projected posteriorly and dorsally, with an inner ventro-posterior protruding line; ampulla rounded, not projected. Aedeagus cylindrical; coecum lobed or reduced; dorso-posterior end of aedeagus hollowed; ventro-posterior end ventrally projected; vesica distally clothed by several reduced spines. Fultura inferior thin; biaf; dorsal projections extending only laterally from aedeagus; ventrally bilobed. Female Genitalia: tergite VIII with an ellipsoid spiracular opening, apart or continuous to external margin. Lamella antevaginalis projected below ostium bursae, forming a tube together with the lamella postvaginalis. Ostium bursae located medi ally in sternigma. Posterl margin of lamella postvaginalis with lateral projections, truncated, rounded or pointed. Ductus bursae membranous, distally sinusous or folded into a &-shape, with thin lateral signa; proximal sclerotization ends sideways to the left; corpus bursae oval.

Gallio carasta (Schaus, 1902) (Figs. 1, 5, 9, 13)


Diasgnose: G. carasta has the antenna shaft ventrally yellowish only on its basal portion; longer forewing, with the length around 11–13 mm (Fig. 1a–d); forewing subapical yellow spots in R₃–M₄ aligned with each other (Fig. 1b); submarginal yellow line of ventral forewing proximally projected (Fig. 1b); forewing ventral surface with the yellow submarginal line in M₃–M₄ not exceeding proximally the subapical yellow spot (Fig. 1b). Dorsal projection of ampulla developed, spined and distally inclined. Distal margin of aedeagus abruptly thinned toward the right side. Lamella antevaginalis bifid as in Gallio imperatriz sp. nov., but with shorter and rounded projections. Posterior margin of lamella postvaginalis with lateral fingered projections.

Type material: The description of V. carasta Schaus, 1902 was based on the male, but the author also mentions a female, indicating at least two specimens used to describe the species. Additionally, Schaus (1902) mentions the type locality as Petropolis [Rio de Janeiro state, Brazil] and the type code number #6037. However, as verified by Dolibaia et al. (2014), the code numbers mentioned by Schaus (1902) may include more than one specimen. After the study of the USNM collection a single syntype belonging to this species was located with the following labels: Petropolis [Rio de Janeiro] Brazil/Collection W. Schaus/V. carasta/Type sp./Schaus/Type No 6037 U.S.N.M./. Thus, aiming to provide stability to the name proposed by Schaus (1902), the above syntype is here designated as the lectotype of V. carasta and the following labels will be added: /LECTOTYPUS/Lectotypus V. carasta Schaus, 1902 Carneiro, Dolibaia, Mielke & Casagrande det. 2015/; these labels will be send to the curator of the USNM.

A second name was proposed to this species, S. gallio Mabille, 1904, that was considered a subjective synonym junior of G. carasta.
by Mielke and Casagrande (2002). Malbile (1904) used of a single specimen on the description of *S. gallio*, interpreted as a holotype by subsequent authors (Evans, 1955; Mielke & Casagrande, 2002; Mielke, 2005). According to Evans (1955), the type specimen is a male depotated at the BMNH having the following labels: (Type/Brazil/ *Stomyles gallio* Malbile)/R. Oberthür Coll. Brit. Mus. 1931-136/.

Images of the lectotype of *V. carassa* Schaus, 1902 and the holotype of *Stomyles gallio* Malbile, 1904 are available in Warren et al. (2015).

**Distribution:** Brazilian coast, from south Bahia to Santa Catarina. Scarce in west Paraná state and Paraguay.

Figs. 5–8. Male genitalia of Gallio species. 5. Gallio carasta (Schaus, 1902), OM 30.007; 6. Gallio imperatriz Carneiro, Dolibaina, Mielke & Casagrande sp. nov. DZ 922; 7. Gallio furtadoi Carneiro, Dolibaina, Mielke & Casagrande sp. nov. DZ 31.641; 8. Gallio eti Carneiro, Dolibaina, Mielke & Casagrande sp. nov. OM 64.567. a. lateral view of genitalia without aedeagus; b. dorsal view of tegumen and uncus; c. inner view of the right valva; d, e and f. aedeagus dorsal, ventral and lateral views respectively.

Fig. 13. Geographical distribution of Gallio species.


Gallio imperatriz Carneiro, Dolibaina, Mielke & Casagrande, sp. nov. (Figs. 2, 6, 10, 13)

Diagnose: This new species can be immediately distinguished from G. carasta by its smaller size, with the forewing length around 9–10 mm (Fig. 2), and by the unaligned forewing subapical yellow spots in R3–M1 due to the proximal position of the spot R4–R5 (Fig. 2). However, the characters listed above are also present in G. furtadoi sp. nov. and G. eti sp. nov. Thus, G. imperatriz sp. nov. is rightly separated from G. furtadoi sp. nov. and G. eti sp. nov. by its distribution only known to southwestern Maranhão, consequently allopatric from the remain two species, and by the characters from...
both male and female genitalia including the ampulla with a dorsal hook-shaped projection proximally inclined; distal margin of harpe medially rounded; aedeagus distal opening mediadly longer and larger; vesica bilobed, producing two long projections covered by several reduced spines of different sizes; lamella antevaginalis bifid from the base producing two long distally divergent arms; ostium bursae proximal; lamella postvaginalis longer than wide, without a distal broad deep indentation, additionally with two short and curved lateral projections; ductus bursae shorter than Galilio carasta with a sclerotization patch within the sinusous part; corpus bursae wider.

**Description:** Forewing length: 9–10 mm. Antenna: nudum 11 to 12. Male genitalia: fenestra reduced. Harpe dorsal projection developed, pointed, posterior projection truncated with a reduced spine. Coecum of aedeagus short, lobed, dorsally straight, slightly curved to the left; distal opening of aedeagus elongated, V-shaped; distal ventral margin of aedeagus mediadly projected and pointed; vesica bilobed, distally clothed by several reduced spines of different sizes in each lobe. Female genitalia: spiracular opening of eighth tergite closed and ellipsoidal. Lamella antevaginalis deeply bifid, with thin and long arms. Distal margin of the lamella postvaginalis with two lateral, short and curved processes. Ductus sinusous and short, with a distinct sclerotization patch within the sinusous part.

**Types:** Holotype male with the following labels: /HOLOTYPUS/Imperatriz, MA[ranhao], Brazil 3-VII-1974 Ex[ursao]. Dep[ar][t]mento. Zoologia/; /DZ 31.501/HOLOTYPUS Galilio imperatriz Carneiro, Dolibaina, Mielke & Casagrande det. 2015/; DZUP.

Allotype with the following labels: /ALLOTYPUS/Imperatriz, MA[ranhao], Brazil 25-VII-1974 Ex[ursao]. Dep[ar][t]mento. Zoologia/; /DZ 31.571/ALLOTYPUS Galilio imperatriz Carneiro, Dolibaina, Mielke & Casagrande det. 2015/; DZUP.


**Distribution:** Known from a single locality in southwestern Maranhão, close to the eastern limits of Amazon forest.

**Etymology:** The name is a reference to the type locality, the only place known for the occurrence of this species.

*Galilio furtadoi* Carneiro, Dolibaina, Mielke & Casagrande, sp. nov. (Figs 3, 7, 11, 13)

**Diagnose:** *Galilio furtadoi* sp. nov. is distinguished from *G. carasta* by its smaller size, with forewing length around 9.5–10 mm (Fig. 3a–d); unaligned forewing subapical yellow spots in R₃–M₁ due to the proximal position of the spot R₄–R₅ (Fig. 3b); submarginal yellow line of ventral forewing (Fig. 3b); the forewing ventral surface with the yellow submarginal line in M₁–M₂ exceeding proximally the subapical yellow spots (Fig. 3b). However, as mentioned on the diagnosis of *G. imperatriz* sp. nov., the characters listed above are shared with both *G. imperatriz* sp. nov. and *G. eti* sp. nov., thus *G. furtadoi* sp. nov. can be distinguished from these species by the trapezoidal tegumen; developed fenestra; distal margin of harpe thinner and pointed; dorsal projection of ampulla reduced; aedeagus longer than the anterior projection of saccus + valva; ejaculatory bulb opening on the anterior margin of the coecum; distal opening of aedeagus short, proximally not projected in dorsal view; distal margin of aedeagus truncated and with a minor rounded projection on the right side; vesica lobed, end covered with several reduced spines; lamella antevaginalis shorter, distal margin with three short projections, two laterals and one at the center; distal margin of the lamella postvaginalis with a developed V-shaped indentation.

**Description:** Forewing length 9.5–10 mm. Antenna: nudum 11. Male genitalia: fenestra developed. Harpe’s dorsal projection as small reduced spine; posterior projection acutate. Aedeagus longer than valva + saccus length, coecum reduced, elbowed, slightly curved to the left; dorso-distal end of aedeagus hollowed, hollow wide, short, not extended anteriorly on aedeagus; ventro-distal end of aedeagus truncated, with a minor rounded projection on the right side; vesica distally clothed by several reduced spines. Female genitalia: lamella antevaginalis projection wide, with lateral and median, rather developed rounded projections. Distal margin of lamella postvaginalis with lateral triangular processes separated by a V-shaped line. Ductus bursae folded in &-shape.

**Types:** Holotype with the following labels: /HOLOTYPUS/Rio Vermelho, C[oron]el. Rio Branco, Cáceres M[a] to Grosso, Brazil, 400 m, 3-VII-1972 Mielke & Brown leg./GEN. PREP. E. CARNEIRO 2014/DZ 31.651/HOLOTYPUS Galilio furtadoi Carneiro, Dolibaina, Mielke & Casagrande det. 2015/; DZUP.

Allotype with the following labels: /ALLOTYPUS/Rio Vermelho, C[oron]el. Rio Branco, Cáceres M[a] to Grosso, Brazil, 400 m, 3-VII-1972 Mielke & Brown leg./GEN. PREP. E. CARNEIRO 2014/DZ 31.641/ALLOTYPUS Galilio furtadoi Carneiro, Dolibaina, Mielke & Casagrande det. 2015/; DZUP.

**Distribution:** Known from a single locality in southern Mato Grosso, Brazil.

**Etymology:** This species honors the butterfly specialist and friend Eurides Furtado, given his valuable contribution to the Brazilian lepidopteran biodiversity.

*Galilio eti* Carneiro, Dolibaina, Mielke & Casagrande, sp. nov. (Figs 4, 8, 12, 13)


**Diagnose:** As in previous new species, *Galilio eti* sp. nov. is distinguished from *G. carasta* also by its smaller size, with forewing length around 9.5–10 mm (Fig. 4a–d); unaligned forewing subapical yellow spots in R₃–M₁ due to the proximal position of the spot in R₄–R₅ (Fig. 4b); submarginal yellow line of ventral forewing on the outer margin (Fig. 4b); and the forewing ventral surface with the yellow submarginal line in M₁–M₂ exceeding proximally the subapical yellow spot (Fig. 4b). On the other hand, these characters also occur in *G. imperatriz* sp. nov. and *G. furtadoi* sp. nov., thus *G. eti* sp. nov. is separated from these two species by the rounded dorsal projection of ampulla, not exceeding the dorsal margin of costa; distal margin of aedeagus thin and pointed, with the distal opening not projected proximally as in *G. imperatriz* sp. nov.; lamella antevaginalis distal margin with a single median projection; lamella postvaginalis rounded, with its distal margin with a developed U-shaped indentation.

**Description:** Forewing length: 9.5–10 mm. Antenna: nudum 11 to 12. Male genitalia: fenestra reduced. Harpe’s distal projection short and rounded, slightly turned dorsally. Ampulla’s dorsal projection short and rounded. Coecum of aedeagus short, laterally straight; dorso-posterior end of aedeagus hollowed; hollow wide and elongated; ventro-distal end of aedeagus mediadly projected, pointed in apex; vesica bilobed, distally clothed by several reduced spines of different sizes in each lobe. Female genitalia: eighth tergite with an ellipsoidal spiracular opening separated from the external margin. Lamella antevaginalis with a median, rounded projection. Distal margin of lamella postvaginalis with lateral truncated processes separated by a U-shaped margin. Ductus bursae membranous folded in &-shape.

**Types:** Holotype male with the following labels: /HOLOTYPUS/ 20–23-VII-2004 50 KM NO DE BUJARI, BUJARI, ACRE [BRAZIL] 200 m, O.-C. MIELKE LEG./GEN. PREP. E. CARNEIRO 2014/OM 64.567/HOLOTYPUS Galilio eti Carneiro, Dolibaina, Mielke & Casagrande det. 2015/; DZUP.


Distribution: Known from two localities from western Amazon in Inambhari endemism area: Bujari (Acre, Brazil) and Parque Nacional Manu (Madre de Dios, Peru).

Etymology: The name comes from the resemblance between the shape of the ductus bursae and the “8” symbol.

Systematic remarks

The name V. carasta was first described in this genus probably due to the presence of yellowish discal spots and lines in both wings ventral surface (Schaus, 1902). Later, Mabille (1904) described Stomyles gallo, whose genus is considered a synonym of Amblyscirtes Scudder, 1872 since Watson (1893). In the catalog of American skippers, Evans (1955) transferred Stomyles gallo from Amblyscirtes Scudder, 1872 to his new proposed genus Gallo, without observing V. carasta, otherwise both names would not be mentioned separately in his catalog. The oldest name was thereafter proposed (Mielke and Casagrande, 2002; Mielke, 2005), and also here maintained as a senior synonym of Stomyles gallo.

Combination of Evans (1955) was probably influenced by its classification system, using in this case the absence of nubum in the antennal club as a character to place Gallo carasta in the “Phanes subgroup” of the “Apastus group”. Given the disparate wing pattern and male genitalia between Gallo and all other genera ascribed to “Phanes subgroup”, Evans (1955), created the genus to include a single species based on its shorter antennae and absence of nubum in club, absence of stigma and by “the faces and the form of genitalia”. “Phanes subgroup” however, has been shown to group a miscellaneous of unrelated Moncini and Anthoptini species given the absence of morphological characters that supports it (Carneiro et al., 2015). Furthermore, Gallo presents more similar characters with some Veilhuis species, than all other species classified in “Phanes subgroup”. For example, Veilhuis serius and V. radus both present basically the same ventral surface wing pattern, which includes: yellowish marked lines between veins, presence of the same yellowish discal and cell spots, and the ground color brown with bluish metallic shade. Additionally, Veilhuis’s nubum in 12 segments agree in number to the variation found in Gallo (10–12 segments), although it differs in its extension to the club.

Nevertheless, although the characters used to describe Gallo are actually misleading (e.g. antennae length is rather longer than half of costa; nubum varies from 10 to 12) or ambiguous (absence of stigma and broad uncus are present in several similar genera), there is no reason until now to include its species in another genus. The uncus, projection of harpe, fultura, and projection of lamella postvaginalis have quite distinct formats, configuring what taxonomists usually calls “genitalia pattern or genitalia form” (e.g. Lindsey, 1921; Evans, 1955; Freeman, 1973). All Veilhuis species present a distinct modification in all those characters, plus the long aedeagus, cornuti shape and sclerotized ductus bursae close to the ostium, which are characters shared with species of Cymaenes (E.C. pers. obs.).

Less than two decades ago a new genus named Ingloius was proposed by Austin (1997) the genus Ingloius extends to the club, while in Gallo it occurs only on apicalus. The recognition of this character however is quite difficult, and can be considered as a “subjective judgment” (Steinhauser, 1989). The placement of Ingloius close to Gallo appears to be correct. Nevertheless the rarity of L. mediocris in collections (this species was only examined by us through its original description and a male illustrated by Warren et al., 2015), and the fact that the female remains unknown does not allow a more accurate taxonomic treatment for Ingloius.

Although the phylogenetic information of Moncini lineages remains unexplored, Gallo currently represents an informative taxonomic group, supported by unique morphological characters in male and female genitalia. It is however, more likely that it is more closely related to genera included “Cymaenes subgroup” than to all taxa listed in “Phanes subgroup”.

Conflict of interest

The authors declare no conflicts of interest.

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