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# The description of *Atlides halljasoni* n. sp. from Ecuador and its spectrographic characterization with some notes on the genus (Lepidoptera: Lycaenidae: Eumaeini)

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ABSTRACT. The eumaeine lycaenid *Atlides halljasoni* n. sp. is described from Ecuador and chacracterized by spectrography. Its intrageneric relationships are discussed. The genus *Riojana* is reinstated from the synonymy of *Atlides*.

Key words: entomology, taxonomy, new species, Lepidoptera, Lycaenidae, *Atlides*, *Riojana*, Andes, South America, scent patch, spectrography, structural coloration.

## INTRODUCTION

In a recently published paper (BÁLINT *et al*. 2003) an undescribed Ecuadorian species of *Atlides* HÜBNER, 1819 (type species: *Papilio halesus* CRAMER, 1777) has been documented in colour and included in the key for identification of all currently known species of this genus. The aim of the present paper is to describe this still unnamed Ecuadorian species, characterize its spectroscopic pecularities and discuss the generic placement and relationships within the genus.

Abbreviations

HNHM - Hungarian Natural History Museum, Budapest, Hungary;
MZUJ – Zoological Museum, Jagiellonian University, Krakow, Poland;
Acronyms: FW-forewing; HD-hindwing; D-dorsal side; V-ventral side.

TAXOMOMY

## *Atlides halljasoni* n. sp.

(Figs 3, 4, 8, 11)

TYPE MATERIAL

Holotype male, deposited in the Zoological Museum of the Jagiellonian University, Kraków, Poland (MZUJ), labeled "ECUADOR / Prov. Morona-Santiago; 9 de Octubre n/Macas / 1700m; 08.2001. / coll. J. Wojtusiak". Specimen in excellent condition, set dorsally, FW length from base to apex: 22mm. MZUJ male paratype no. 1 and 2 with the same data: "ECUADOR / Prov. Morona-Santiago; Macas / 1700m; 10.2001. / coll. J. Wojtusiak". (HNHM) paratype male (no. 3), also with holotype data (dissected; Bálint gen. prep. No. 1082).

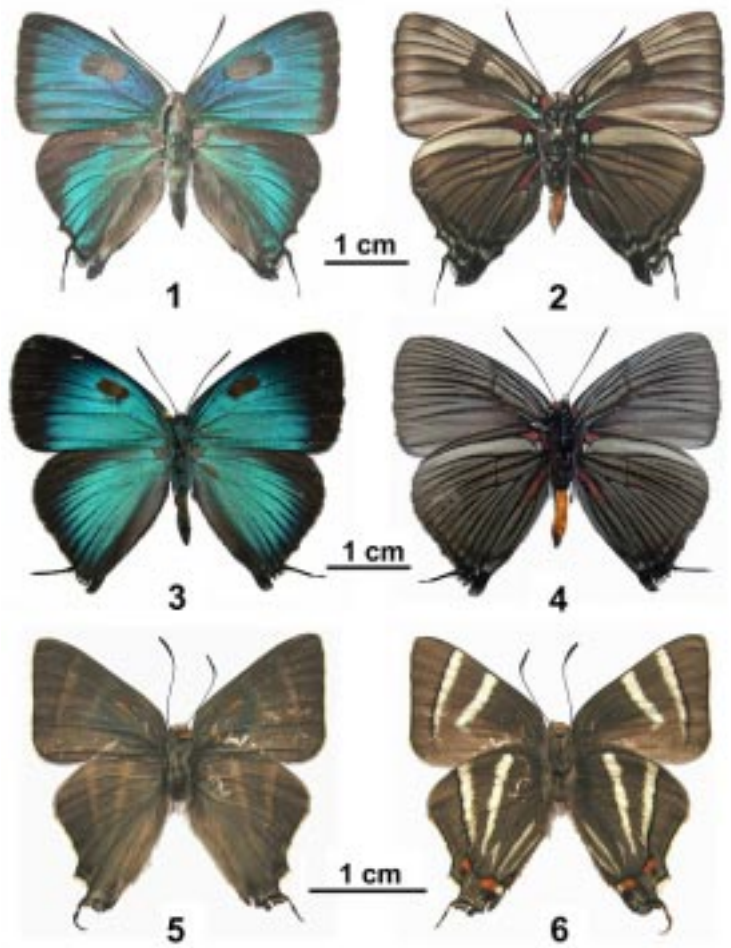
DIAGNOSIS

Resembling its congener *A. bacis* (GODMAN & SALVIN, 1887) (Figs 1-2) whose males possess more or less circular and uniformly black scent pad and a vivid green wing dorsa (Fig. 7). In contrast, the scent pad of the male of *A. halljasoni* is more complex (Fig. 8). The distal part of the pad is covered with light brown scales, whilst the basal part contains black scales. The reflectivity of wings of *A. bacis* is considerably lower than that of the new species but the highest peak of their respective spectral figures are almost at the same point (Fig. 10). The two species also look similar from ventral side, but *A. halljasoni* (Figs 3-4) has a weak FW discocellular line and all the intercellular spaces from costal margin to vein CuA1 are patterned with a delicate black line running parallelly to veins and are also covered with black scales. The congener *A. bacis* lacks this trait, and its FW discocellular line is heavily marked.

DESCRIPTION

Male. Head black with black scales in vertex and white scales between antennifers in anteclypeus; eyes brown and hairy with black rings white coloured in front and rear; palpi black, short and almost filamentous; antennae black, their length reaching postdiscal scent patch. Thorax dorsally metallic green, ventrally black; legs black with white and orange scaled femurs. Wing dorsa (Fig. 3) green or bluish with the shade of hue strongly dependent on the angle of falling light (metallic green at 90°); dorsum with duplex discoidal scent pad in the apex of the discal cell: tuft containing basally black, distally brown androconial scales; postdiscal area between radial veins with brown scent patch (Fig. 8); outer margin and submargin with wide black border extending basalwards in every intercellular space; HWD colouration as that on FW, but without androconia, vein CuA2 terminus with filamentous 5mm long tail-like extension, tornal part with lobe along an extention of the vein 3A. Wing ventra unicolourous light brown (Fig. 4), FW with strongly scaled black veins and intercellular black lines running parallelly between costal margin and vein CuA1; costal area red basally, cubital vein in

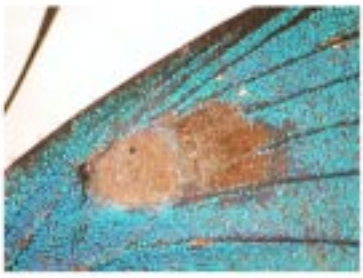
basal area covered with larger tuft, probably scent scales; the intercellular area CuA1 and CuA2 displaying also structural colouration, fringes black; HWV similarly coloured and patterned to that of FW but basal and subbasal area between veins CuA2 and 3A with an additional red, tornal and submarginal area extending between veins CuA and anal margin grey with some iridescent blue scales. Abdomen dorsally brown, ventrally orange; genital structures typical for large eumaeines with heavily sclerotized and wide tegumen with a pair of dorsal brush organs, curved gnathos, strong appendix angularis and bilobed, but short valvae supporting extremely long aedeagus (Fig. 11).




1-2. *Atlides bacis* (GODMAN & SALVIN, 1887), male, Colombia (coll. DAHNERS, Cali, Colombia): 1 - male dorsum, 2 - male ventrum. 3-4. *Atlides halljasoni* n. sp. MZUJ, holotype male: 3 - male dorsum, 4 - male ventrum. 5-6. *Riojana thargelia* (BURMEISTER, 1878), Argentina (coll. HNHM): 5 - male dorsum, 6 - male ventrum

Measurements: FW length from base to apex 23-25 mm, the length of genital structures: valva in ventral aspect = 1.15 mm; saccus length = 3.8 mm, internal penis = 1.4 mm, external penis = 5.6 mm; dorsal capsule = 1.7 mm.

Female. Unknown, may be slightly larger than the male and having wider wings and an additional tail at vein terminus CuA1, dorsal colouration probably bluish or ash blue, FWD without androconia, but wing ventra presumably with same colouration and pattern.



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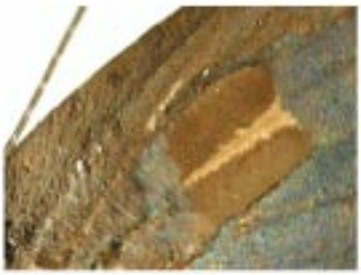

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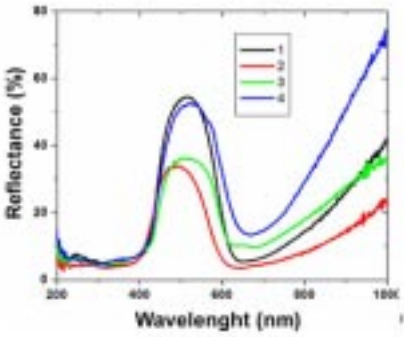


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7-9. Forewing discal part with scent pad and scent patch: 7 - *Atlides bacis*, 8 - *Atlides halljas*oni n. sp., 9 - *Riojana thargelia* – (coll. HNHM). 10. Spectrography of four *Atlides* species (see Table I in the text). Black = *A. dahnersi*, Red = *A. browni*, Green: *A. bacis*, Blue = *A. halljasoni* n. sp. 11, 12. Male genitalia in ventral view: 11 - *Atlides halljasoni* (length of aedeagus: 7 mm), (HNHM paratype no 3), 12 - *Riojana thargelia*, (length of aedeagus: 3 mm), (HNHM, Bálint gen. prep. No. 847)

DISTRIBUTION

Geographic: known only from the type locality in Ecuador; elevational: the type material was collected at moderate elevation 1700 m; temporal: the type material was collected in July.

ETYMOLOGY

The species is dedicated to the American riodinid specialist Jason HALL (The National Museum of National Hisotry, Smithsonian Institute, Wahingtom DC), who remarked via personal communication that he was aware of the existence of this beautiful species.

## SPECTROSCOPY

The aim of the spectrographic analysis was to check the hypothesis that the species is more closely related to *A. bacis* than to *A. halesus* as it was thought after analysing wings characters.

Spectrography measurements were carried out using an Avantes 2048 fiber optic spectrometer working in the ultraviolet, visual, and near infrared range of wavelengths (200-1000 nm). Measurements of light, after reflection from the centre of discalis on right FWD beside the scent pad, were taken in each individual at the angle of 90° to the plane of the wing (Table I.).

The results of spectrographic measurements are presented in Fig. 10. The species *A. halljasoni* possesses reflectivity almost as high as *A. dahnersi*, but corresponding peaks of their spectral figures are somewhat shifted. Moreover, *A. halljasoni* displays the strongest reflection in light of all tested species. Generally, the three species, *A. bacis*, *A. dahnersi* and *A. halljasoni*, with greyish HWV cell Sc+ R1 look very similar, but more bluish *A. browni* is characterized by lower reflectivity and a peak in blue. This difference can also be judged visually. All of these species have more or less similar hue except *A. browni* in which the colour seems to be strongly light dependent and turns into blue if the light falls on

Table I. Specimens used for spectrographic measurements, all from the Lepidoptera collection of the HNHM. First column - species name with author and date; second column - capture data; third column: spectrographic measurements serial number run in the Department of Nanotechnology, Research Institute for Technical Physics and Materials Science, Hungarian Academy of Sciences.

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| *Atlides bacis* (Godman & Salvin, 1887 | COLUMBIA: Alto del Pyrón, Villamaria, 2000m, 5.x.2003. | No 90 |
| *Atlides browni* Constantino, Salazar & Johnson, 1993 | COLUMBIA: Valle Rio Aguacatal, San Antonio, 2200m, 8.iii.2004. | No 91 |
| *Atlides dahnersi* Bálint, Constantino & Johnson, 2003 | COLUMBIA: Valle Rio Aguacatal, San Antonio, 2200m, 6.iv.2003. | No 92 |
| *Atlides halljasoni* sp. n. | ECUADOR: Prov. Morona-Santiago; 9 de Octubre n, Macas, 1700 m; 07. 2001. | No 93 |

scales under a different angle. We may speculate that scale nanostructures in all investigated species are qualitatively very similar, but their quasi ordered nanostructures display different hues. Similarity in the position of peaks of maximum reflectivity indicates that despite differences in reflectivity, *A. bacis*, *A. dahnersi* and *A. halljasoni* can be treated as closely realted species. Their similar wing shape and pattern as well as the genitalia structures provide other arguments for such a statement.

## DISCUSSION

***Atlides* species group:** We have placed the new species in the genus *Atlides* which was characterized by BÁLINT *et al.* (2003: 257). When the congeneric *A. dahnersi* had been described, the new species was placed in a group of species charaterized by the trait of "HWV surface with lighter intercellular space of Sc+R1". This is an obvious character, however at present, we cannot judge whether this trait indicates monophyly, or not. The recently published checklist of the Neotropical Lepidoptera (LAMAS 2004: 119) seems to be in agreement with this placement: species having lighter ventral hind wing cell Sc+R1 have been placed together as no. 84: *A. atys* (CRAMER, 1775), no. 85: "[n. sp.] ROBBINS, MS, Ecuador" (= *A. halljasoni* n. sp.) and no. 86. *A. bacis* (GODMAN & SALVIN, 1887). This trait is obviously a good character based on spectroscopic data, which appeared to be a useful tool for detecting phylogenetic relationships in polyommatines (BÁLINT *et al.* 2005). Our spectrographic analysis also supports the view that despite the different hue, *A. dahnersi* actually may stay closer to *A. bacis* and *A. halljasoni* than to *A. browni* which represents the *halesus* species group. Obviously, the genus can be split into several species groups, but constructing a phenogram revealing true relationships needs more character analysis and spectral measurements as some curious supralimital taxa can be found in the genus like *A. zava* (HEWITSON, 1878) (*cf.* D'ABRERA 1995).

We exclude from monophyly of *Atlides* the nominal taxon *Thecla thargelia* (BURMEISTER, 1878) (type species of *Riojana* D'ABRERA & BÁLINT, 2001) and its undescribed sister species, as indicated in LAMAS (2004). The arguments for such a decision are as follows.

***Riojana* stat. rev.:** The species *Thecla thargelia* appeared in the checklist edited by LAMAS, (2004: 119) as unsupported combination, *Atlides thargelia* (BURMEISTER, 1878) ROBBINS, 2004 and as terminal taxon of *Atlides* together with its undescribed Brazlian sister species. The genus *Riojana* originally was considered monotypic. This new species will be described in a separate paper (BÁLINT, *in prep.*).

The genus *Riojana* differs from *Atlides* at least in having the following important characters that we consider synapomorphies of the genus (Figs 5-6,12): (1) eye orbit orange (white in *Atlides*); (2) dorsal FW scent pad horizontally divided by a row and tuftly arranged lighter androconial scales (scent pad vertically divided by a row in *Atlides*); (3) dorsal FW scent patch situated basally in the

discalis (scent patch situated apically in the discal cell in *Atlides*) and (4) male has no structural ground colour on dorsal FW but possesses a blue band (male dorsal FW ground colour entirely structural in *Atlides*). Shape and pattern of wings and characters of genital structures also differ in many aspects and will be analyzed in another paper dedicated to *Riojana*. We do not know whether the genus is in sister relationship with *Atlides,* or not and whether it is basal, or terminal. We can asume that, if it is terminal, it most probably represents the phenomenon of discoloration (c.f. BIRÓ *et al.* 2003; BÁLINT *et al.* 2005). However, the lineage is too divergent, and on the basis of all the aspects mentioned we are of the opinion that the species is a representative of an ancient, basal clade, or a lineage whose most closely related group is hitherto unknown.

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