| Genus | Vol. **17**(4): 571-584 | Wrocław, 28 XII 2006 |
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# Contributions to the knowledge of Neotropical Lycaenidae: Notes on the genus *Abloxurina* with descriptions of five new species (Lepidoptera: Theclinae: Eumaeini)

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ABSTRACT. Five lycaenid butterfly species are described from the Andes: *Abloxurina acjabamba* n. sp. (type locality: Acjanaco, Cuzco, Peru); *A. duviolsi* n. sp. (type locality: Acjanaco, Cuzco, Peru), *A. falcatamba* n. sp. (type locality: Oxapampa, Pasco, Peru), *A. molipampa* n. sp. (type locality: Molinopampa, Amazonas, Peru), *A. oxapampa* n. sp. (type locality: Oxapampa, Pasco, Peru). *Abloxurina ismaeli* (BUSBY & HALL, 2005) comb. n. is introduced. The species are included into *Penaincisalia* genus group on the basis of male androconial character, and in the genus *Abloxurina* on the basis of wing shape. The importance of characters of male genitalia is also discussed.

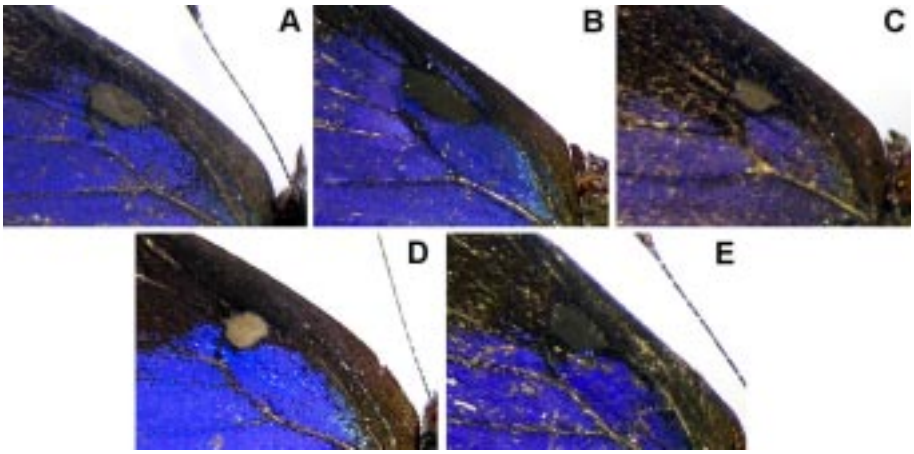
Key words: entomology, taxonomy, Lycaenidae, *Penaincisalia* genus group, *Abloxurina*, generic diversity, genera, new species, structural colouration, genital characters.

## INTRODUCTION

The genus *Abloxurina* was erected by JOHNSON (1992) with the type species *Thecla amatisa* DOGNIN,1895 for six species. In the Checklist of Neotropical Butterflies (ROBBINS 2004) (hereafter CNB) four of them have been placed in synonymy, one of them in a new combination and the genus itself was considered as synonym of *Penaincisalia* JOHNSON, 1990 (type species: *Thecla culminicola* STAUDINGER, 1894).

Recently we reviewed the *Penaincisalia* genus group and defined an apomorphy for *Abloxurina* (BÁLINT & WOJTUSIAK 2006), reinstating the genus to its original status. In that paper we placed the genus *Candora* JOHNSON, 1992 (type species: *Candora fallacandor* JOHNSON, 1992) in synonymy with *Abloxurina* on the basis of the hypothesis that the type species of these genera represent the same biological species. The genus *Candora* was erected for seven species. Six of them were synonymized and one was transferred into another genus in the CNB. Subsequently three species-group names were proposed in combination with *Candora*, of which only one was kept in the CNB as a valid name. However, the existence of three undescribed species were indicated between *Penaincisalia balzapamba* (JOHNSON, 1992) ROBBINS, 2004 (described as *Abloxurina*) and *P. albalineata* (JOHNSON, 1992) ROBBINS, 2004 (described as *Candora*), as well as further three species without diagnosis between *P. albalineata* and *P. penai* JOHNSON, 1990. We are aware that probably one of these six undescribed species is a sister species of *Abloxurina balzapamba* JOHNSON, 1992 that has been already described as "Penaincisalia ismaeli" by HALL *et al*. (2005).

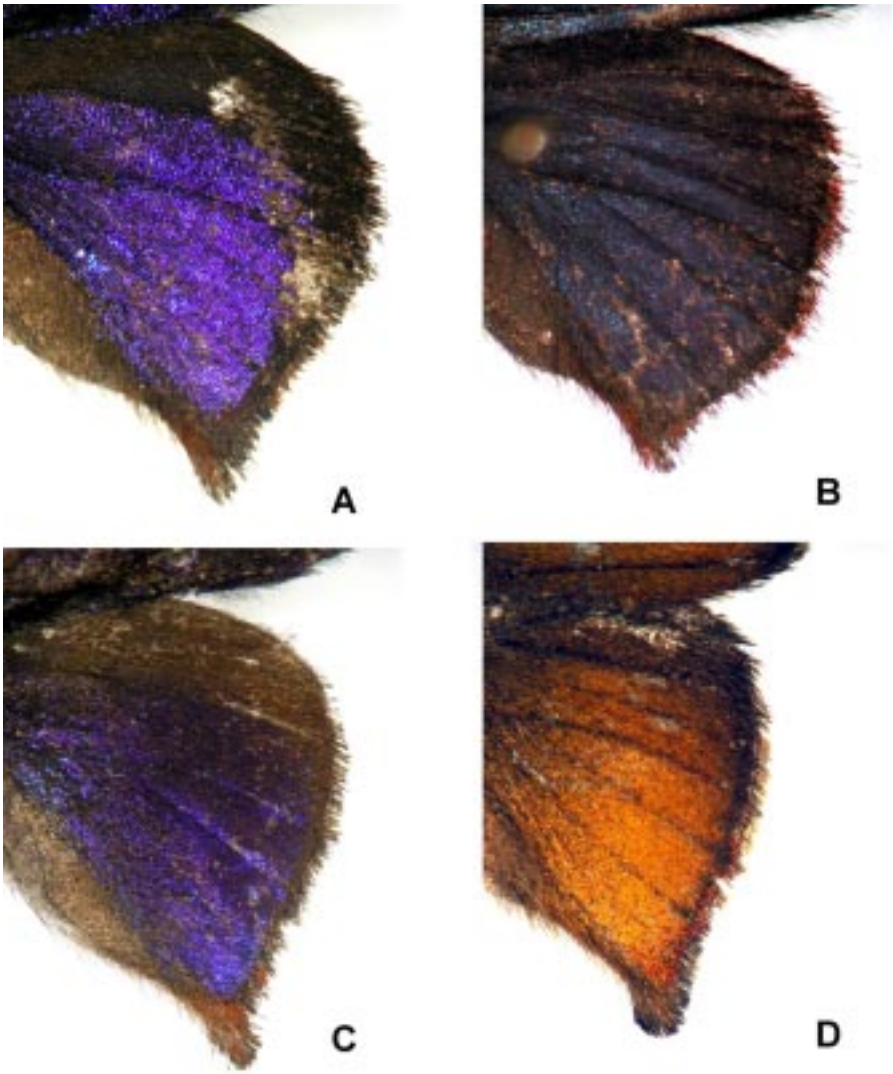
For a couple of years we have been aware of the existence of certain *Abloxurina* species in the Andes since many of them were collected in the field by us. Hitherto none of them have been described. Present paper is aimed to name, describe and document them. All the taxa in question are easy to identify on the basis of wing shape characters and colour pattern. This is in accordance with the statement of the CNB eumaeine list compiler who wrote: "The richest source of traits for distinguishing eumaeine species is wing pattern, followed by androconia and only then by genitalia, including brush organs".




1. *Abloxurina* dorsal fore wing androconia: A - *A. duviolsi* n. sp., B - *A. oxapampa* n. sp., C - *A. molipampa* n. sp., D - *A. falcatamba* n. sp., E - *A. acjabamba* n. sp.

Consequently we do not present characters based on genital structures. According to our view it is necessary only when phylogenetic relationships are surveyed (see Discussion). Hence we present a one-sentence diagnosis for each species and a brief but informative description, which are supplemented by the colour figures of the name bearing holotypes and in one case also the opposite sex.

The species we are describing below are placed in the genus *Abloxurina* on the basis of wing shape characters. The genus is included into the *Penaincisalia*




2. *Abloxurina* apomorphy; sexes of *A. amatista* with hind wing tornal lobe: A - male, B - female; sexes of *A. balzapamba* with hind wing tornal lobe: C - male, D - female

genus group on the basis of male androconia character (BÁLINT & WOJTUSIAK 2006). The scent patch in male *Abloxurina* is situated along the disco cellular vein l (Fig. 1).

The apomorphy of *Abloxurina* is an expanded vein 3A in hind wing often associated with an incurved anal margin (Fig. 2).

Beside the peculiar hind wing lobe the genus *Abloxurina* has a complex hind wing colour pattern composed of a dark basal and subbasal areas supplemented by lighter, often yellow row of medial patches; the dark medial zigzagged line reaching vein CuA2, then runs to the subbasal part of the anal margin. The distal part of the anal margin is lighter.

The primary types will be deposited in the butterfly collections of the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru (MUSM). Secondary types are in the Hungarian Natural History Museum (Budapest, Hungary) (HNHM), Zoological Museum, Jagiellonian University, Krakow, Poland, (MZUJ) and in the private collection of PIÉRRE BOYER (CB).

## ***Abloxurina duviolsi* n. sp.**

(Figs. 1A, 3-4)

TYPE MATERIAL

Holotype: male, labelled as: "Olivier Duviols Leg., Acjanaco vers Boca Manu, (Cuzco) 3000 m, PEROU, 15/04/2005". (MUSM). The specimen is in perfect condition, set dorsally.

DIAGNOSIS AND DESCRPITON

There is no similar looking *Abloxurina* with such remerkably toothed wing margins, and no similar lycaenid species in the Neotropical region.


3, 4. *Abloxurina duviolsi* n. sp.: 3 - holotype dorsum, 4 - holotype ventrum

Holotype: male dorsal wing colour is light structural blue with large oval scent pad in discalis apex and black distal border. Hind wing anal lobe large and grey coloured. All distal vein termini on both wings with extensions resulting in a toothed wing margin. Fore wing ventral ground colour brown with black discoidal line, median and submedian pattern also black, apex with pinkish suffusion, submarginal area reddish brown. Hind wing ventrum with pattern typical for the genus, but because of unusual colouration unique for the genus. Basal area black, subbasal patches at costa and medial pattern pale greyish brown with black frame, apex pinkish, submedial area black, submarginal area reddish brown, anal part at base yellowish grey, then pinkish, anal margin not particularly bent, anal lobe darker greyish brown.

Female not known.

BIONOMICS

Known only from the holotype male collected in April, at 3000 m.

ETYMOLOGY.

The species is named in honour of Olivier DUVIOLS, the collector of the holotype.

## ***Abloxurina oxapampa*** **n. sp.**

(Figs. 5-8, 14)

TYPE MATERIAL

Holotype: male, labelled as: "Pierre Boyer Leg., La Antena, 2400/2600m, SE d'Oxapampa, (Oxapampa, Pasco), PEROU, 29/10/2004", (MUSM). The specimen is in good condition, wing dorsa slightly worn, set dorsally.

Paratype no. 1. (allotype female): labelled as: Pierre Boyer Leg., La Antena, 2750m, d'Oxapampa (Oxapampa, Pasco), PEROU, Juin 2004 (CB). Paratype nos 2-3 (males): La Antena, 2400/2600m, III.2004, SE d'Oxapampa, (Oxapampa, Pasco), PEROU. Paratype nos 4-5 (females): from the same locality, 2750 m, IV.2004 and VIII.2004 (CB). Paratype nos 6-9 (males): from the same locality, 2700 m, IV.2005 (CB). Paratype no. 10 (male): Carpish, Huanuco, Peru, 2850-3050 m, 27.VII.2002. (HNHM; gen. prep. Bálint no. 1098). Paratype nos 11-12 (males): Molinopampa, Via Granada, Amazonas, Peru, 2965 m, 29.VI.1998 (MZUJ). Paratype no. 13 (male): Peru, dep. Pasco, Oxapampa, Antenas de Chacos, 2800 m, X.2004 (MZUJ).

DIAGNOSIS AND DESCRIPTION

Resembling *Abloxurina duviolsi* in wing shape but vein termini less conspicuous and hind wing anal lobe rufous, ventral colour pattern typical for the genus.

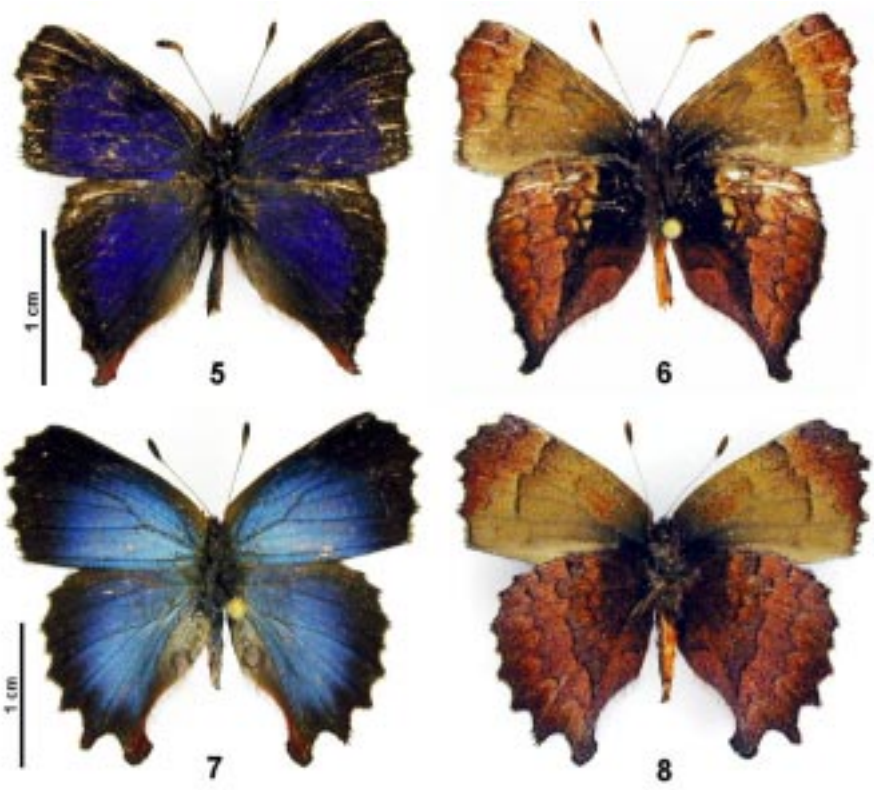
Male dorsal wing colour structural light blue with large oval scent pad in discalis apex and black distal border, all vein distal termini in both wings minutely

extended. Fore wing ventral ground colour brown in basal and medial area with delicate black discoidal line, median and submedian pattern black, submedial area pale yellow, submarginal area reddish brown from apex to vein CuA2, submargin with suffused dark pattern. Hind wing ventrum with pattern typical for the genus, basal area dark brown, medial area with yellow pattern, submedial and submarginal area reddish brown, submarginal pattern composed of delicate intervenial crescents, anal margin not particularly bent, anal lobe conspicuous with greyish colouration.

Female. Similar to the male in ventral wing colouration pattern but subbasal patches on hind wing not light, on dorsal side wings with silvery blue colouration, all distal vein termini conspicuously expanded.

BIONOMICS

Known only from type data. Males were collected in March, April, June, July and October between the elevations of 2400 and 3050 m. Females were collected in April, June and August at the elevation of 2750 m.




5-8. *Abloxurina oxapampa* n. sp.: 5 - holotype dorsum, 6 - holotype ventrum, 7 - allotype dorsum, 8 - allotype ventrum

ETYMOLOGY

The species is named after the type locality in rhyme with the congener *A. balzapamba.*

REMARKS

Because of similar ventral wing pattern, sympatric and synchronic occurrence we associate the two phenotypes as the different sexes of the same biological species.

## ***Abloxurina molipampa* n. sp.**

(Figs. 1C, 9-10)

TYPE MATERIAL

Holotype: male labelled as: "Benigno Calderon Leg. Molinopampa 2900/ 3100m, (Amazonas), PEROU, Janvier 2001". (MUSM). The specimen is in good condition, left antenna missing, set dorsally.

Paratypes no. 1 (male): Molinopampa, Amazonas, Peru, XI.2002 (HNHM; genit. prep. Bálint no. 1099). Paratype no. 2. (allotype female): Peru, Dept. Amazonas, Molinopampa, 2965 m, 29.VI.1997 (MZUJ; genit. prep. Bálint no. 807) [allotype of *Jagiello molinopampa* BÁLINT & WOJTUSIAK, 2000].

DIAGNOSIS AND DESCRIPTION

Widely rounded wing shape resembling that of the females of the *Abloxurina amatista* group (*c.f.* JOHSNON 1990), but the hind wing anal margin is conspicuously bent.

Male dorsal wing colour structural, deep violet blue with oval scent pad in discalis apex and black distal border. Fore wing ventrum almost patternless, ground colour mottled pinkish brown with somewhat lighter anal area. Hind wing ventral side pinkish with dark pattern typical for the genus, but medial patches faint, almost unvisible, antemarginal area darker, anal margin with subbasal spot.


9, 10. *Abloxurina molipampa* n. sp.: 9 - holotype dorsum, 10 - holotype ventrum

Female. Similar to male, but with silvery blue colour on dorsal side of wings and orange brown on ventral side. The colour pattern more vestigial and subbasal spot on hind wing conspicuous.

BIONOMICS

Known only from the type data. Males were collected in January and November in the elevation zone between 2900 m and 3100 m. Female was collected in June, at 2965 m.

ETYMOLOGY

The species is named after the type locality, the village Molinopampa in rhyme with the congener *A. balzapamba*.

REMARKS

Because of the similar ventral wing pattern and sympatric occurrence we associate the two phenotypes as different sexes of the same biological species.

## ***Abloxurina falcatamba* n. sp.**

(Figs. 1D, 11-12)

TYPE MATERIAL

Holotype: male labelled as: "Jose Böttger Leg., La Antena, 2750m, d'Oxapampa (Oxapampa, Pasco), PEROU, 16/10/2004"; (MUSM), set dorsaly, in relatively good condition, fore wings sligthly damaged.

Paratypes (n= 8) all male and all from the holotype locality. Paratype nos 1-2: 2400-2600 m, III.2004. Paratype no. 3: 2400-2600 m. IV.2004. Paratype no. 4: 2700 m, IV.2004. Paratype no. 5: 2750 m., 16.X.2004. Paratypes nos 6-8: 2400-2600 m, 29.X.2004 (CB).


11, 12. *Abloxurina falcatamba* n. sp.: 11 - holotype dorsum, 12 - holotype ventrum

DIAGNOSIS AND DESCRIPTION

Because of wide and rounded wing shape resembles females of *Abloxurina amatista* group but the hind wing anal margin is conspicuously bent as in the congener, *A. molipampa*; the species differs from *A. molipampa* by differently shaped male dorsal fore wing androconia and delicately patterned wing ventra.

Male dorsal wing colour light structural blue with oval scent pad in discalis apex and wide black distal border. Fore wing ventral ground colour brown in basal and medial area with delicate black discoidal line, black median and submedian pattern, anal area lighter yellowish brown. Submedial area pale reddish brown, submarginal area pale brown with grey apex, submargin with suffused dark pattern. Hind wing ventrum with pattern typical for the genus, basal area dark brown, medial area with yellowish patches, submedial area reddish brown, submarginal area darker brown with intervenial dark partches, anal margin bent, lobe conspicuously reddish with greyish antemarginal colouration.

Female not known.

BIONOMICS

Known only from the type data. Males were collected in March, April and October, between 2400 m and 2750 m.

ETYMOLOGY

The species is named after the conspicously sickle-shaped bent hind wing anal margin ("*falcatus*") in rhyme with the congerer *A. balzapamba.*

## ***Abloxurina acjabamba* n. sp.**

(Figs. 1E, 13-14)

TYPE MATERIAL

Holotype: male, labelled as: "Jose Böttger Leg., La Acjanaco vers Boca Manu, km 10 (Cuzco) 3000m, PEROU, Avril 2005", (MUSM), set dorsally, in good condition, wing dorsa sligthly worn.

Paratype (male): Sillapucana, Marcapata, 3300 m, dep. Cuzco, Peru, 12.II.2005 (MZUJ).

DIAGNOSIS AND DESCRIPTION

Because of wide and rounded hind wing shape the species is somewhat resembling females of *Abloxurina amatista* group, but its fore wing is more like in *A. oxapampa* without extended vein termini and very bright dorsal structural blue colour with metallic hue; wing ventra curiously colourful and sharply patterned.

Male dorsal wing colour light structural blue with oval scent pad in discalis apex and wide black distal border; hind wing anal lobe reddish brown. Fore wing ventral ground colour brown in basal and medial areas with delicate black discoidal crescent, median and submedian pattern delicate, submedial and submarginal

areas light yellowish brown with pink hue, anal area ligther yellowish brown. Hind wing ventrum with pattern typical for the genus, basal area dark brown, subbasal patches near costa orange with pinkish hue, medial area with reddish brown pattern and yellowish brown patches, submedial area reddish brown, submarginal area darker brown with intervenial dark partches, veins conspicuously marked, anal margin bent, lobe reddish.

BIONOMICS

Known only from the holotype data. The male was collected in April, at elevation 3000 m.

ETYMOLOGY

The species is named after the type locality in rhyme with the congerer *A. balzapamba.*


13, 14. *Abloxurina acjabamba* n. sp.: 13 - holotype dorsum, 14 - holotype ventrum

## DISCUSSION

In this paper we have described five lycaenid butterfly species from the Andes hitherto unknown to science. The descriptions may look curious because no genital characters have been considered. The reason for this has been mentioned in the introduction. Further comments are as follows:

The hypotheses that these species represent real taxa are based on the following premises: (1) Lycaenid butterflies are day flying insects, therefore their phenotypical appearance is important in their individual lifes. (2) Especially important are spectroscopic properties of their wing dorsa that reflect light dependent structural colours that have primary role in interspecific, infraspecific and intersexual communications. (3) As spectral differences in light reflectance

are making for their specific identity, the function of ventral wing surface is to provide each butterfly with cryptic colouration. Therefore, as it was testified so convincingly on *Thecloxurina* (cf. BÁLINT et al. 2006), reflected wing colours are species dependent specific visual signals and as such, they can help members of each species to occupy separate niches and interact with their biota differently. (4) Because of that they can be recognized as real taxa, since they are real "taxpayers" in the ecosystem. (5) Consequently, we argue that structures that constitute a part of insect visual communication systems and are specialised in reflection of species specific light signals of particular wavelengths are equally important for taxonomy as other characters traditionally used by taxonomists in evaluation of particular taxa.

Colouration patterns on ventral side of wings in butterflies are generally cryptic. This is also the case of the genus *Abloxurina,* where the ground colours of wings are light brown matching those of the tips of twigs, the preferred perching sites for hilltopping males (Fig. 15).

In certain species, light brown colouration is associated with conspicuously undulated wing margins what helps the insect to mimic fallen leaves perfectly. This phenomenon seems to be better developed in female phenotypes (e.g. *A. molipampa*, *A. oxapampa*) which suggests that females may tend to spend more time resting on fallen leaves on the forest floor. None of the taxa we place in the *Penaincisalia* genus group possess this kind of colour patterns and this suggests that they may also differ in their behaviours.

15. La Antena, South East of Oxapampa, Pasco, Peru; the solitary tree offering perching sites for various eumaeine lycaenids. (Photo: Pierre BOYER)

The colour pattern of the ventral side of wings probably plays a role in the camouflage when butterflies are basking and exposing their ventral side to the sun rays. Individuals of *Abloxurina* can be found positioning themselves in such a way that their hind wing pattern harmonizes with the margin of the leaf on which they are at rest (Fig. 16).

Different patterns of camouflage and mimicry that have been developed in certain groups of species can be explained as a result of their specialisation to the life in different ecological niches, therefore each pattern that evolved in particular lineage can be seen as its characteristic feature. The genera *Abloxurina*, *Penaincisalia*, *Pons* and *Thecloxurina* were able to evolve their own systems of camouflage and mimetism. More accurate conclusions can be made however, when more field data on life history and behaviour of these fascinating lycaenid butterflies are available.

Generally speaking, both dorsal and ventral sides of wings in lycaenids are used for generating visual stimuli but each side for sending different kind of messages. The fact that blue structural colours in male dorsa may play an important role in sexual behaviour was pointed out also by LUNDGREN (1977) for lycaenids living in the temperate regions, as well as gleaming spots on hind wing ventra of females by FORDYCE *et al.* (2002). The distinctness of structural colours on species level was proved when their measurable physical properties (BÁLINT *et al*. 2006) were judged. Therefore qualitative characters of lycaenid genital

16. Ventrally basking, cryptically coloured *Abloxurina amatista* in open paramo habitat (Gualaceo, Ecuador) (Photo: Pierre BOYER)

structures seem to be useful and can be used for estimation of higher level of relationships (species groups, genera or genus groups). However, their value for discrimination at specific level may also be indicative when longer series of specimens are examined and the results obtained will be in concordance with characters on wings. In some cases they may contradict results obtained from molecular studies (*c.f.* NICE & SHAPIRO 1999).

Concerning the genus *Abloxurina* it was stated by HALL *et al.* (2005) that: (1) "the unique male genital valve shape within the genus – short and broadly triangular with only a tiny posterior projection of the tip" and (2) "both species [*P. balzapamba* and *P. ismaeli*] also have more-or-less the longest aedeagi in the genus".

The first character was also stressed by JOHNSON (1992) when he erected *Abloxurina* as "valva short" (p. 26). However, this character is not typical for the type species (*c.f.* the documentation in JOHNSON 1990: 8, *P. candor* male and 1992: Fig. 27, *C. fallacandor*) nor for the males of *A. molipampa* and *A. oxapampa* that we dissected. More confusingly, the genital documentation of *A. amatista* by JOHNSON (1990: fig. 9B, "Thecla amatista holotype", the same in 1992: fig. 2, "Abloxurina amatista holotype") does not represent *Penaincisalia* genus-group species. We dissected three *A. amatista* male individuals collected in southern Ecuador (gen. prep. Bálint nos 1100-1102) which have structures almost identical to those of *A. oxapampa* (Figs. 17-18). Therefore the character of short valva supports the monophyly of the *balzapamba-ismaeli* species pair within the genus (the documentation of JOHNSON, 1992: fig. 24, "A. balzapamba", and HALL *et al*. ,2005: fig. 4, "P. ismaeli").

Hence we remove the nominal taxon "ismaeli" from *Penaincisalia* and place it in *Abloxurina* resulting *Abloxurina ismaeli* (BUSBY & HALL, 2005), BÁLINT, **new combination**. The aedeagus character reported by HALL *et al*. (2005) as "more-or-less the longest" in the genus seems to be indicative only for the *balzapamba-ismaeli* lineage. However the definition is misleading and we define it as having aedeagus the most slender in the genus-group with gnathos width at distal terminus. In other species-groups the width of aedeagus is equal to the basal width of the gnathos. The aedeagus length compared to genital capsule is in the same


17-18. *Abloxurina* male genital capsules with aedeagi, 17 - *A. amatista*, 18 - *A. oxapampa*

measure as in the other genera of the *Penaincisalia* genus group, or species groups in *Abloxurina*, so it is not indicative even for species-group levels.

Because of all arguments we have pointed out, it is justifiable that *Abloxurina* should be recognized as a separate lineage in the *Penaincisalia* genus group, since it can also be subdivided on polytypic species groups, and that the genital morphology of *Abloxurina* has no more weight in the alpha taxonomy, as it is in the case of certain day flying lycaenids belonging to Polyommatina or Eumaeina.

ACKNOWLEDGEMENTS

Present work has been written in the frame of the program BioPhot, EU6 NEST (no. 12915) and was partly founded in Hungary by the OTKA grant no 42972 to Zsolt BÁLINT. In Poland this work was supported by the WRBW/IZ/12/06 - Jagiellonian University grant.

Authors would like to express their gratitude to Artur CZEKAJ for his help in preparing colour illustrations.

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