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REPORT ON THE SUBGENUS *IDIOVULPECULA* KARISCH, 2013 (LEPIDOPTERA, EREBIDAE, ARCTIINAE, LITHOSIINI) FROM GABON

SUMMARY

As part of the identification of African material in the collections of MSNS and the author, a new species is described: *Cyana* (*Idiovulpecula*) *tertia* n. sp.

In addition, a re-description of *Cyana* (*Idiovulpecula*) *togoana* (Strand, 1912) is provided, and a series of male specimens diagnosed herein is thought to represent the hitherto undiscovered male of *Cyana magnitrigutta* Karisch, 2013.

RIASSUNTO

Nel corso di classificazione del materiale africano delle collezioni del MSNS e dell'autore, si descrive una nuova specie: *Cyana* (*Idiovulpecula*) *tertia* n. sp.

Inoltre, si fornisce la ridescrizione di *Cyana* (*Idiovulpecula*) *togoana* (Strand, 1912) e si suppone che una serie di soli maschi qui diagnosticata possa rappresentare il maschio non ancora scoperto di *Cyana magnitrigutta* Karisch, 2013.

INTRODUCTION

During the preparation of an extensive account of the genus *Cyana* Walker, 1854 in Gabon, I extrapolated the data available for the subgenus *Idiovulpecula* Karisch, 2013, judging them to be worthy of consideration; datum from Nigeria is also added (see Remarks there and Discussion). This could be the first of a series presenting the data regarding the partial outcomes of a more general study on the moths of Gabon.

The subgenus was created by Karisch (2013) to include species of the genus *Cyana* which exhibit, among other traits, the presence of a medium-sized oval lobus on the underside of the forewings, an obsolescent R2 vein, the stem of R3+R4 cutting across the lobus, a long robust thorn on the curved distal process of the ala valvae (sacculus in Karisch 2013), a tapered coecum penis and an aedeagus covered externally with numerous small thorns.

The subgenus has already been revised by Volynkin & László (2019), who described two new species (*Cyana* (*Idiovulpecula*) *lowa* Volynkin & László, 2019 and *Cyana* (*Idiovulpecula*) *foya* Volynkin and László, 2019, and upgraded to species level *Cyana* (*Idiovulpecula*) *maculata* Karisch, 2013, which they also moved from the subgenus *Cyabarda*. They added as new diagnostic characters of *Idiovulpecula* two more features of the genitalia: in the male, the juxta bearing a medial ventral crest, and the costal protrusion of the valva bearing a heavily sclerotized transverse crest; in the female, a heavily sclerotized postvaginal plate.

In the present paper, I describe one new species from Gabon; I report the female record of *Cyana* (*Idiovulpecula*) *togoana* (Strand, 1912) from Nigeria with re-description of the genitalia; I diagnose a series of male specimens thought to represent the hitherto undiscovered male of *Cyana magnitrigutta* Karisch, 2013; finally, I provide a discussion about the diagnostic characters of the subgenus.

ABBREVIATIONS

ANPN Agence Nationale des Parcs Nationaux (Gabon)
BMNH British Museum of Natural History, London, UK (currently, NHMUK)
CENAREST Centre National de la Recherche Scientifique et Technologique, Libreville, Gabon
Gen. sl. n. number of the genitalia slide
IRAF Institut de Recherches Agronomiques et Forestières, Libreville, Gabon.
IRET Institut de Recherche en Ecologie Tropicale, Libreville, Gabon.
MAD acronym of the author
MSNS Museo di Storia naturale del Salento (Natural History Museum of the Salento), Italy

Museum acronym follows Evenhuis (2020).

MATERIAL AND METHODS

The material used for this paper was collected by the author during several expeditions in Gabon, conducted from 2011 to 2019 between November and June; and in Nigeria from January 1985 to June 1987.

In both places the climate is equatorial: rain forest in Gabon with transitional characteristic between the Western Congolese forest with Atlantic influences and the true Western Congolese forest, without a clear line of demarcation (Vande Weghe 2010); montane gallery forest in Nigeria (pers. obs).

Moths were collected at sheets and traps. In Nigeria, a 160-watt blended light bulb was used both for the trap and for the sheet, left on all night, normally three times weekly. In Gabon, the sheet lights consisted of three 500-watt blended light bulbs placed ca. 200 m from each other in front of a white cotton sheet, operated from 7 p.m. to about midnight. Specimens were also collected in the mornings on and around the white sheets. The light traps were modified versions of the Pennsylvania type (Fig. 1. Southwood, 1987), positioned in denser vegetation in order to capture specimens of less vagile species and those repelled by intense light. Moths caught at the sheet were killed upon capture, using ammonia vapours or by freezing, and pinned the following morning; moths caught in the traps were killed by tetrachloroethane vapour released by a vial inside the trap. These specimens were subsequently rehydrated before spreading the wings (Winter 2000). Genitalia were dissected following Durante (2008). The terminology for the genitalia follows Birket-Smith (1965) with some modifications (Klots, 1970; Scoble, 1992; Holloway *et al.*, 2001; Kristensen 2003). Genitalia were photographed

Fig. 1 - The light trap used for moths' collection.

and mounted under an Olympus SZX9 trinocular stereomicroscope. Figures at higher scale were obtained from specimens under a cover-glass taken by a digital camera Panasonic HDC-TM300 mounted on a Leica DMLED biological microscope. The pictures were improved and figures processed using PHOTOSHOP CC2015. The material is stored in the MSNS and the author's collections.

RESULTS

Genus *Cyana* Walker, 1854
Subgenus *Idiovulpecula* Karisch, 2013

***Cyana* (*Idiovulpecula*) *tertia* Durante n. sp.** (Figs. 2, 5)
Holotype: ♂; Gabon, Monts de Cristal, Kinguélé, 0°27'12"N 10°16'40"E; 24/30-11-2019; Durante leg.; gen. sl. n. 960 MAD; in coll. MSNS.
Paratypes: 2 ♂♂; same data as the holotype. All in the author's collection.

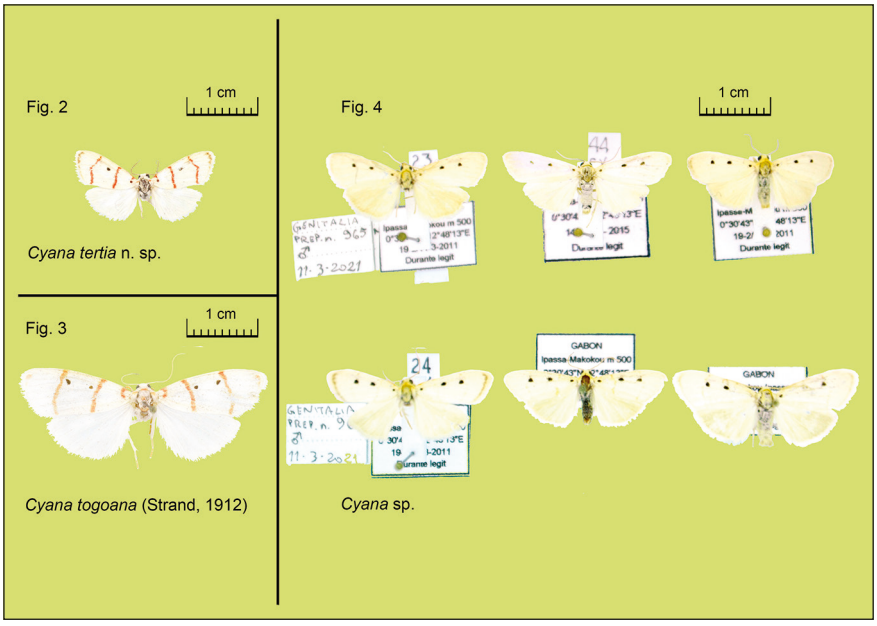

Fig. 2 - *Cyana (Idiovulpecula) tertia* Durante n. sp., holotype. Fig. 3 - *Cyana* (*Idiovulpecula*) *togoana* (Strand, 1912), Nigeria, Cross River State, Obudu. Fig. 4 - *Cyana* sp., the series of unnamed male specimens.

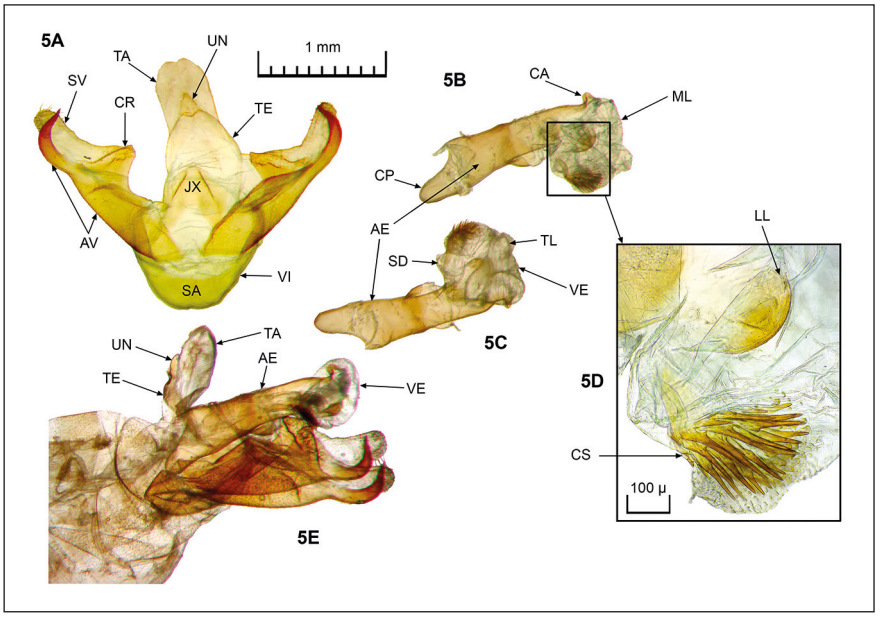

Fig. 5 - *Cyana (Idiovulpecula) tertia* Durante n. sp., male genitalia. 5A, genitalia complex, ventral view, aedeagus missing; 5B, aedeagus, left view; 5C, aedeagus, right view; 5D, magnified latero-ventral portion of the vesica; 5E, genitalia complex, lateral view, aedeagus in situ. AE, aedeagus; AV, ala valvae; CA, dorsal carina; CP, coecum penis; CR, crested process of the costal margin of the valva; CS, ventral cluster of spines; JX, juxta; LL, left small diverticulum; ML, main lobus; SA, saccus; SD, small diverticulum; SV, supravalva; TA, tuba analis; TE, tegumen; TL, T-shaped lobus; UN, uncus; VE, vesica, VI, vinculum.

Diagnosis

Cyana tertia n. sp. belongs to the red-striated white species of the *Cyana* genus, so it is easily distinguishable from the unstriated ones.

Among the former, it is somewhat similar to *Cyana* (*Volitivulpecula*) *ellipsis* Karisch & Dall'Asta, 2010, *C.* (*Cornutivulpecula*) *usambara* Karisch, 2013, *C.* (*Cornutivulpecula*) *nussi* Karisch, 2013 and *C.* (*Caudovulpecula*) *delicata* (Walker, 1854), which all have a red fascia angled outwards almost as much as in *tertia* n. sp.; however, all of them differ in terms of the shape and inclination of the antemedian red fascia, and the presence of a well-marked distal discal dot, which is very small or virtually absent in *tertia* n. sp. A species that is probably closely related is *Cyana* (*Idiovulpecula*) *foya* Volynkin & László, 2019 (see below for genitalia-based diagnosis), which again differs in terms of the shape and inclination of both the antemedian and postmedian red fasciae.

The male genitalia are of the *Idiovulpecula* type, but they differ from the type subgeneric species *Cyana* (*Idiovulpecula*) *pretoriae* (Distant, 1897) in having, among other traits, an aedeagus without spines. In contrast, they are very similar to those of *C. foya*, but the aedeagus and everted vesica are clearly distinctive: the aedeagus is slender in *foya* and comparatively stout in *tertia* n. sp.; the vesica of *foya* has a large, membranous, sack-like diverticulum, which is missing in *tertia* n. sp. In addition, the curved distal process of the ala valva is shorter and more sharply angled in *foya* than in *tertia* n. sp. At the same time, the aedeagus in *tertia* differs from that of the series of males examined below in that it is stouter and has a smaller and more irregular vesica.

Description

Wingspan 18-20 mm. Forewing upperside ground colour pure white. Costa white with its basal third (up to the antemedian fascia) orange-red. Pattern consisting of three orange-red fasciae: a basal one from the costa to the basal dot; an antemedian almost straight; a postmedian angled outwards. Marginal reddish-brown suffusion, quite intense at the apex, vanishing toward the tornus. Small reddish-black basal dot (a mixture of red and black scales); two discal black dots, the proximal one larger, almost halfway between the orange-red fasciae, the distal one very small, obsolescent, almost adjacent to the postmedian fascia.

Forewing underside ground colour pure white. Costa white with its basal third orange-red. Light brown streak on the anterior vein of the discoidal cell up to the lobus where it forms a small brownish dot. Present also a second light brown dot in the same position as the proximal one on the upperside.

Lobus oval, very small, just beyond the upper corner of the discal cell (very similar to the one shown in Fig. 49 in Karisch, (2013), which however concerned the subgenus *Cornutivulpecula* Karisch, 2013). Fringes white.

Hindwing upperside and underside ground colour pure white, unmarked. Fringes concolorous.

Head white; antennae ciliated, ochreous yellow; labial palpi porrect, extending beyond the frons (lateral view), white with the third segment orange; patagia white; tegulae white with an orange patch in the middle. Thorax white. Forelegs with white femurs; tibiae orange inside, white with a central orange patch outside, tarsi orange with a white ring in the middle and a white distal tip. Midlegs with white femurs; tibiae white with a central orange patch on the outside; tarsi orange with a white ring in the middle and a white distal tip. Hindlegs white; tarsi with distal third pale orange and white tip. Spurs formula 0-2-4.

Genitalia ♂

Uncus triangular in dorsal view, eruciform in lateral view, with distal tip hook-like, ventrally linked to the tuba analis and anteriorly incorporated in the tegumen; tegumen triangular in dorsal view with slender pedunculi (sen-

su Diakonoff, 1939); tuba analis membranous, large, linked dorsally to the tegumen-uncus complex; vinculum U-shaped, more robust than the tegumen; saccus likewise robust, shallow; juxta roof-like. Valva with prominent plica centripetalis, extending mesad, but not forming a sclerotized continuous transtilla; costa protruding mesad with a robust crested trigonal process (probably the processus distalis plicae of Birket-Smith 1965); apex of the supravalva flap-like, quite densely setose at the distal end; ala valvae highly sclerotized along its entire length, ending in a strong pointed thorn bent inwards. Aedeagus tubular, straight, with a distal dorsal small papilla-like carina; coecum penis bell-shaped, up to ¼ the length of the aedeagus; vesica with the main lobus globular, exhibiting on the left a small diverticulum with terminal portion slightly sclerotized, a cluster of spines ventrally, on the right a vaguely T-shaped lobus and a small dome-shaped diverticulum more ventrally, beside the cluster of spines.

Etymology
The species is dedicated to my students in the current school year (2020-2021) attending classes in the third year (*tertia*) of course D in the secondary school of the town of Borgagne (South Italy), who waited patiently during my long periods of absence while conducting my moth collection expeditions.

***Cyana* (*Idiovulpecula*) *togoana* (Strand, 1912)** (Figs. 3, 6)
Material: ♀; Nigeria, Cross River State, Obudu [Obudu Cattle Ranch], m 1.500; 17/18-2-1996; gen. sl. n. 415 MAD; in coll. MSNS.

Diagnosis
Cyana togoana belongs to the red-striated white species of the Cyana genus, so it is easily distinguishable from the unstriated ones.

Among the former, it is externally similar to *Cyana* (*Volitivulpecula*) *venusta* Karisch, 2013, and *Cyana* (*Caudovulpecula*) *delicata* (Walker, 1854), from which it differs in terms of its parallel and minimally bent outwards red antemedian and postmedian fasciae (slightly convergent at the costa in *venusta*; clearly convex in *delicata*); it differs primarily in the morphology of the genitalia (specifically, in *venusta* the corpus bursae is contiguous with the axis of the ductus and there is no signum, while the ductus bursae is less sclerotized and longer than in *C. togoana*; in *delicata* the corpus bursae is large, sack-like, with a small rounded signum, while the ductus bursae is sclerotized, intrudes into the corpus, and is much longer than in *C. togoana*). *Cyana togoana* is also similar to *Cyana* (*Idiovulpecula*) *pretoriae* (Distant, 1897), and *Cyana* (*Idiovulpecula*) *rwandana* Karisch, 2013. The latter have more convex red fasciae, whereas *pretoriae* is more similar, but the distal black dot on the forewing is elongated (round in *C. togoana*). Nevertheless,

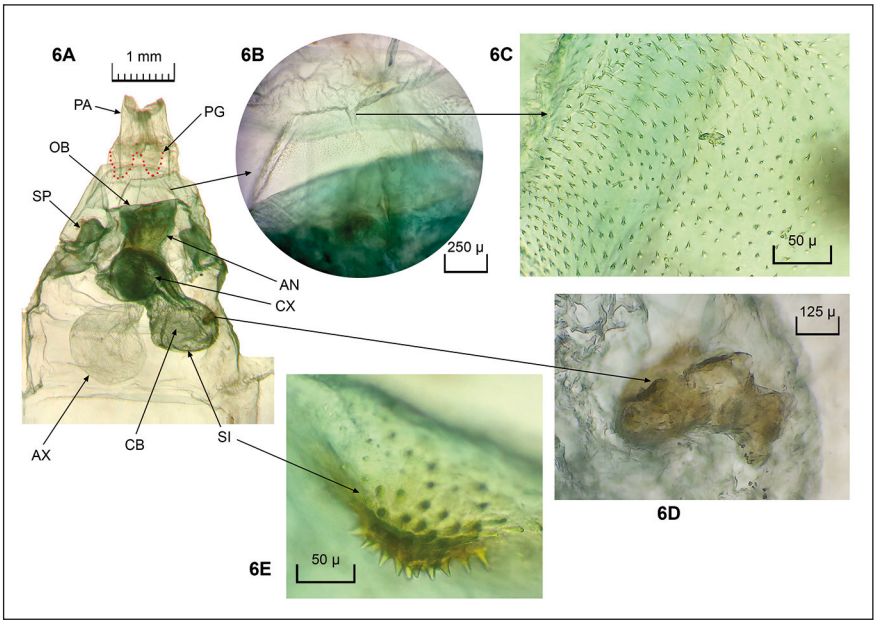

Fig. 6 - *Cyana (Idiovulpecula) togoana*, female genitalia. 6A, overall view; 6B, lamella postvaginalis; 6C, the same, magnified; 6D, thickening of the corpus bursae, magnified; 6E, signum, magnified. AN, antrum; AX, appendix bursae; CB, corpus bursae; CX, cervix; OB, ostium bursae; PA, papillae anales; PG, dorsal pheromone glands (red dashed line); SI, signum; SP, sterno-pleural pouches.

it must be considered that *C. togoana* is "a highly polymorphic species, in which the width of transverse lines, the size of black dots and even the forewing shape vary within the same population" (Volynkin, pers. com.).

The most reliable diagnosis however is based on the morphology of the genitalia: *rwandana* is the most easily excluded, due to its slender ductus bursae and smaller ostium; the ductus of *pretoriae* is of a similar shape, but is much longer, and its corpus bursae is sack-like and never double as in *C. togoana*.

Re-description (mainly based on the Nigerian specimen)
Wingspan 35 mm. Forewing upperside ground colour pure white. Costa white with its basal third (up to the antemedian fascia), and at the ends of the orange-red fasciae, pale orange. Basal fascia orange, short (from costa to the anal vein), with the ends curving inwards; antemedian fascia orange, oblique, slightly bent outwards; postmedian fascia orange, straight from costa to the first cubital vein (CuA1), then bent inwards. A few orange scales at the apex. Two discal black dots, spaced well apart inside the antemedian and postmedian fasciae; the distal one larger.

Forewing underside ground colour pure white; antemedian and postmedian fasciae obsolescent orange. Costa white with its basal third yellowish. Fringes white.

Hindwing upperside and underside ground colour pure white, unmarked. Fringes concolorous.

Head white; antennae ciliated, ochreous yellow; labial palpi porrect, extending beyond the frons (lateral view), white with the third segment orange; tegulae white with an orange patch in the middle.

Head white, but frontoclypeal area and labial palpi straw-yellow, the latter porrect, extending beyond the frons (lateral view); antennae minimally ciliated, white at the base, then straw-yellow; patagia white with a small orange internal dot on the posterior margin; tegulae white with an orange patch in the middle. Thorax white with a vanishing orange dot in the middle and an orange shadow on the posterior margin of the scutellum. Forelegs with white femurs; tibiae very pale yellow inside, deeper yellow outside with white dot in the middle and white distal tip; tarsi yellow with a white ring in the middle and white distal tip. Midlegs with white femurs; tibiae annulated white and yellow; tarsi yellow with a white ring in the middle and white distal tip. Hindlegs white; tarsi yellow with a white ring in the middle and white distal tip. Spurs formula 0-2-4. Abdomen whitish.

Genitalia ♀

A7 slightly larger than A6, membranous, with its cephalic margin forming two backward-facing sterno-pleural pouches (about half as deep as A7). A8 about half as long as A7 and membranous, with trapezoidal soft lamella postvaginalis, and anterior apophyses slightly shorter than A8. Papillae anales soft and as long as A8, posterior apophyses twice as long as the anterior ones. Female dorsal pheromone glands unpaired, anteriorly double-pouched, shorter than posterior apophyses. Ostium bursae membranous, large, without evident sclerotization. Ductus bursae large, highly sclerotized, bent to the right (ventral view); funnel-shaped in the posterior half (antrum), exhibiting a Λ-like sclerotization in the anterior part; ventrally, at the junction with the corpus, it presents a globular cervix with a membranous roundish appendix. Ductus seminalis originating from the appendix. Corpus bursae membranous, vaguely ampulla-like, with a small round dimpled signum at the anterior end, and a noticeable thickening of dense tissue not stainable with chlorazol black.

Remarks

A new locality from Nigeria is herein reported for *Cyana togoana*, extending its areal to the South-East (Cross River State), in an environment of montane gallery forest (the preceding data in Karisch 2013 are from lowlands: Lagos (mangrove forest), 10 m asl; Kaduna (Sudanian savannah), 590 m asl, and from Kumbo (this locality, without coordinates in the original label in the

BMNH collection (see Karisch, 2013: 91), could be: Kumbo, Niger State, 9°.58'N, 6°.04'E, ca 230 m asl, transition between Guinean and Sudanian savannah; however, the measure of the altitude does not match the original datum reported on the label: 5500 ft).

Unnamed male specimens (Figs. 4, 7)
The following description is related to a series of six male specimens doubtless belonging to the subgenus *Idiovulpecula*, but with no certainty of belonging to an as-yet undescribed species (see Remarks below).

Material
1 ♂; Gabon, Makokou, Ipassa, 500 m, 0°30'43"N 12°48'13"E; 14/24-3-2015. 1 ♂; same locality; 5/10-4-2010. 4 ♂♂; same locality; 19-2/11-3-2011.; gen. sl. n. 965 MAD and 966 MAD. All Durante leg, in the author's collection.

Diagnosis
These specimens all belong to the white, unstriated species of the *Cyana* genus, so they are easily distinguishable from the majority of *Cyana* species, which have red vertical bands on the upperside of the forewings. Among the unstriated species, they are easily distinguishable from *Cyana rufifrons* (Rothschild, 1912) due to the absence in the latter of black dots on the upperside of the forewings; and from *Cyana meyi* Karisch, 2013 and the white form of *Cyana heidrunae* (Hoppe, 2004), which have only two black dots on the upperside of the forewings. They are, however, quite similar to *Cyana trigutta* Walker, 1854, with which they share the colour and three black dots on the upperside of the forewings. Nevertheless, *Cyana trigutta* is of a pure white colour, while these specimens are a dull ivory white.

Their genitalia clearly belong to the *Idiovulpecula* type, but, differ from all other species in the subgenus in terms of their external colour and pattern (white wings in the unnamed male specimens, maculated or striated in the other species).

Remarks
All characters indicate that these specimens should be identified as belonging to *Cyana magnitrigutta* Karisch, 2013, the only species in the subgenus with a virtually identical habitus; unfortunately, of this species only one female specimen from Cameroon has been described, and in the series collected in Gabon there are no females. Everything suggests they are specimens of the undescribed male of *magnitrigutta*, but given the high biodiversity and pronounced tendency to endemicity of the rainforest, it is better to be cautious and wait for a sympatric couple.

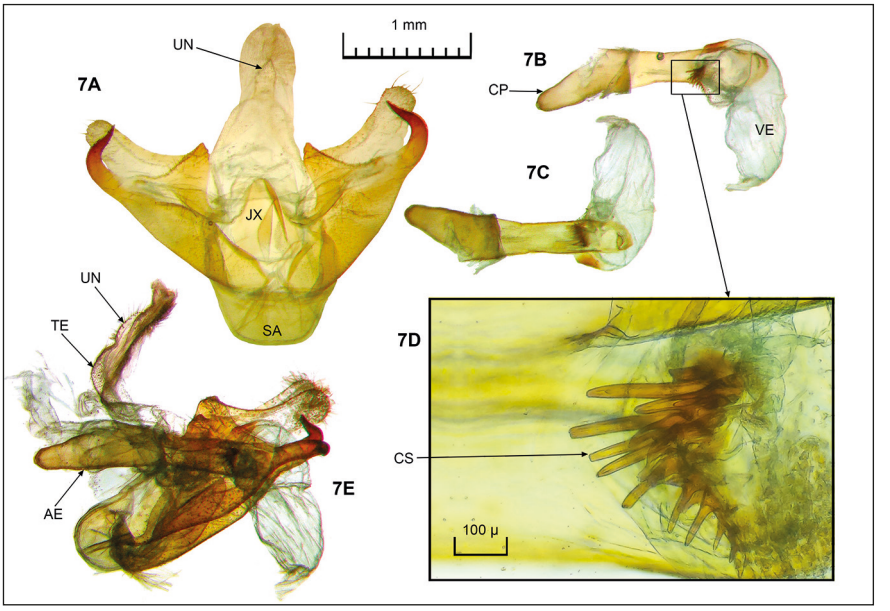

Fig. 7 - *Cyana (Idiovulpecula)* sp., male genitalia. 7A, genitalia complex, ventral view, aedeagus missing; 7B, aedeagus, left view; 7C, aedeagus, right view; 7D, magnified latero-basal portion of the vesica; 7E, genitalia complex, lateral view, aedeagus in situ. AE, aedeagus; CP, coecum penis; CS, ventral cluster of spines; JX, juxta; SA, saccus; TE, tegumen; UN, uncus; VE, vesica.

DISCUSSION

The subgenus *Idiovulpecula* seems to be more inclusive than originally diagnosed by Karisch (2013). Indeed, Volynkin and László (2019) noted that more characteristics should be added (i.e. in the male, the juxta bearing a medial ventral crest, and the costal protrusion of the valva bearing a heavily sclerotized transverse crest; in the female, a heavily sclerotized postvaginal plate). Here I suggest that in this subgenus the aedeagus could also have a smooth surface, as seen in *tertia* n. sp., and in *lowa* and *foya* (and not only a "tube covered with a ring of many delicate, short thorns" as observed by Karisch 2013: 86).

Similarly, regarding the female genitalia, the "female genitalia [with] heavily sclerotized postvaginal plate" observed by Volynkin and László (2019: 382) does not refer to the whole of the subgenus, as the lamella postvaginalis of *togoana* is soft (i.e. membranous).

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