A revision of Albuna dybowskii Le Cerf, 1917, with the establishment of a new genus of Osminiini from Africa (Lepidoptera: Sesiidae)

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RESEARCH ARTICLE

A revision of *Albuna dybowskii* Le Cerf, 1917, with the establishment of a new genus of Osminiini from Africa (Lepidoptera: Sesiidae)

Daniel Bartsch[1] & Dominic Wanke[1,2]

Abstract

A new genus of Afrotropical Osminiini, *Spatenkana* Bartsch, **gen. n.**, is described based on the type species *Albuna dybowskii* Le Cerf, 1917, which was previously combined with the genus *Synanthedon* Hübner, [1819]. Moreover, a second species, *Albuna africana* Le Cerf, 1917, is assigned to the new genus (**comb. n.**). Both species were only known from the female holotypes. Recently, four specimens of *S. dybowskii* **comb. n.**, one female each from Zambia, Zimbabwe and Mozambique and one male from South Africa, were discovered. These specimens represent the first records for these countries. Furthermore, they allow a description of the male, the genitalia structure of the female and a classification of this species for the first time.

Keywords: DNA barcoding, new combinations, Osminiini, Paranthrenini, pheromones, systematics.

Zusammenfassung

Eine neue Gattung afrotropischer Osminiini, *Spatenkana* Bartsch, **gen. n.**, wird basierend auf der Typusart *Albuna dybowskii* Le Cerf, 1917 beschrieben, die bisher mit *Synanthedon* Hübner, [1819] kombiniert wurde. Außerdem wird dieser neuen Gattung eine zweite Art, *Albuna africana* Le Cerf, 1917 zugeordnet (**comb. n.**). Von beiden Arten waren nur die weiblichen Holotypen bekannt. Jüngst entdeckt wurden vier Exemplare von *S. dybowskii* **comb. n.**, je ein Weibchen aus Sambia, Simbabwe und Mosambik sowie ein Männchen aus Südafrika. Diese Exemplare stellen die ersten Nachweise für diese Länder dar. Darüber hinaus erlauben sie erstmals eine Beschreibung des Männchens, der Genitalstruktur des Weibchens und eine Einordnung dieser Art.

Introduction

Le Cerf (1917) described two species of clearwing moths from tropical Africa in the North American genus *Albuna* Edwards, 1881 of the tribe Paranthrenini, namely *A. dybowskii* Le Cerf, 1917 and *A. africana* Le Cerf, 1917, based on one female specimen each. In his description of *A. dybowskii*, he stated doubtfully: "il n'est pas certain que cette espèce soit bien à sa place dans le genre *Albuna* Hy-Edw. […]". Later, Hampson (1919) transferred both species, obviously due to Le Cerf's generic placement, to the genus *Paranthrene* Hübner, [1819], also in the tribe Paranthrenini. In a review of the African Paranthrenini, Bartsch (2008) excluded these two species from this tribe and provisionally transferred them to the genus *Synanthedon* Hübner, [1819] of the tribe Synanthedonini, based on the fairly well-fitting appearance and wing venation.

Two females of *A. dybowskii* from Zimbabwe and Zambia were part of a series of African Sesiidae donated by Jonathan Ball (Cape Town) to the first author. A third female from southern Mozambique was discovered in the collection of the National Museum of Natural History, Pretoria. Additionally, a single male was caught by the first author in South Africa, near the Zimbabwean border, using synthetic pheromones. Examination of morphological characters of these newly collected specimens showed that *A. dybowskii* and *A. africana* need to be transferred to the tribe Osminiini and assigned to a new genus, which is described below.

Material and methods

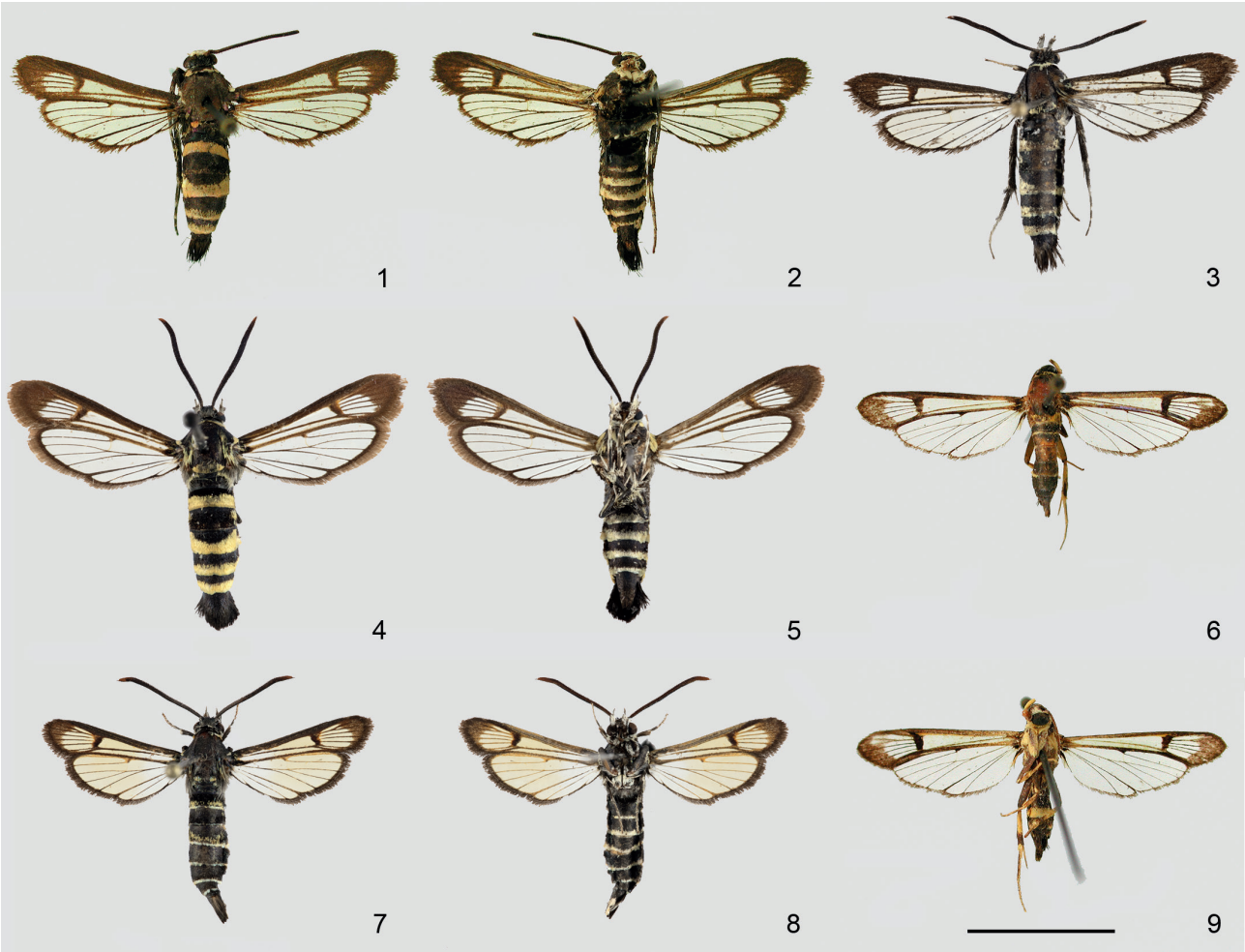
The synthetic pheromones used in this study are available from Pherobank B.V., Wijk bij Duurstede, The Netherlands. Original data for holotypes are presented verbatim in quotation marks; label data are given with months as Roman numerals and with line breaks indicated by a slash.

The examined specimens are deposited in the following collections:

DNMNH = Ditsong National Museum of Natural History (formerly Transvaal Museum), Pretoria, South Africa.
MNHP = Muséum National d'Histoire Naturelle, Paris, France.
SMNS = Staatliches Museum für Naturkunde, Stuttgart, Germany.

Morphological examination

Type material and the original descriptions served for the identification and comparison of specimens. Specimens were photographed using a Visionary Digital photography system



Figs. 1–9. Specimens of *Spatenkana* Bartsch, **gen. n.** – **1–2**. *S. dybowskii* (Le Cerf, 1917), **comb. n.**, holotype ♀. **3**. *S. dybowskii*, ♀, Zambia, Ingwe. **4–5**. *S. dybowskii*, ♀, Zimbabwe, Greenhill Bindura. **7–8**. *S. dybowskii*, ♂, South Africa, Limpopo. **6, 9**. *S. africana* (Le Cerf, 1917), **comb. n.**, holotype ♀. Scale bar: 10 mm.

(LK Imaging System, Dun. Inc.) equipped with a Canon EOS 5DSR camera. For the preparation of genitalia, standard techniques were used (e.g., Robinson 1976). Genitalia were embedded as permanent slides in Euparal and photographed with a Keyence VHX-5000 photomicroscope.

DNA barcoding

DNA extraction and amplification of the barcode fragment (658 base pairs of the 5' terminus) of the mitochondrial gene *Cytochrome-C Oxidase I* were performed using standard protocols (e.g., Ivanova et al. 2006). PCR amplification products were sent to Macrogen for sequencing. Genetic distances were calculated using MEGA X (Kumar et al. 2018; Stecher et al. 2020) based on the K2P model by Kimura (1980). A complete list of specimens used for the analysis is presented in Appendix 1 along with sampling sites and Process ID numbers.

Systematic part

Spatenkana Bartsch, gen. n.

Type species: *Albuna dybowskii* Le Cerf, 1917.

Description

Medium sized, compact clearwing moths, with alar expanses 22–27 mm. Head: proboscis developed, weakly sclerotized, especially in female; labial palpus bent upwards, tip reaching middle of frons in male and base of antenna in female, first and third palpomeres half as long as second, smoothly scaled, first and second palpomeres ventrally rough, second with distinctly longer scales in basal half and laterally with some longer, bristle-

like scales; frons and vertex slightly rough; scales of vertex and pericephalic scales short; antenna clavate, ciliate in male. Thorax and legs: strong, mainly smoothly scaled, partially rough on tibiae. Wings: hyaline; discal spots rather narrow; forewing veins R_1–R_3 somewhat approximated, R_4 and R_5 with common stalk in basal half; hindwing vein M_2 arising from costal third of discal vein, M_3 and CuA_1 from common point. Abdomen: cylindrical, smoothly scaled, anal tuft well developed.

Male genitalia

Tegumen and uncus relatively small and narrow; uncus densely covered with simple, basad-pointing setae; gnathos absent; valva upturned, distally narrowed, apically round, ventral margin and distal portion covered with long, hair-like setae, middle part with area of dense, long, mostly bifurcate setae; saccus short and broad; phallus long and narrow, distal portion short, vesica with numerous minute cornuti.

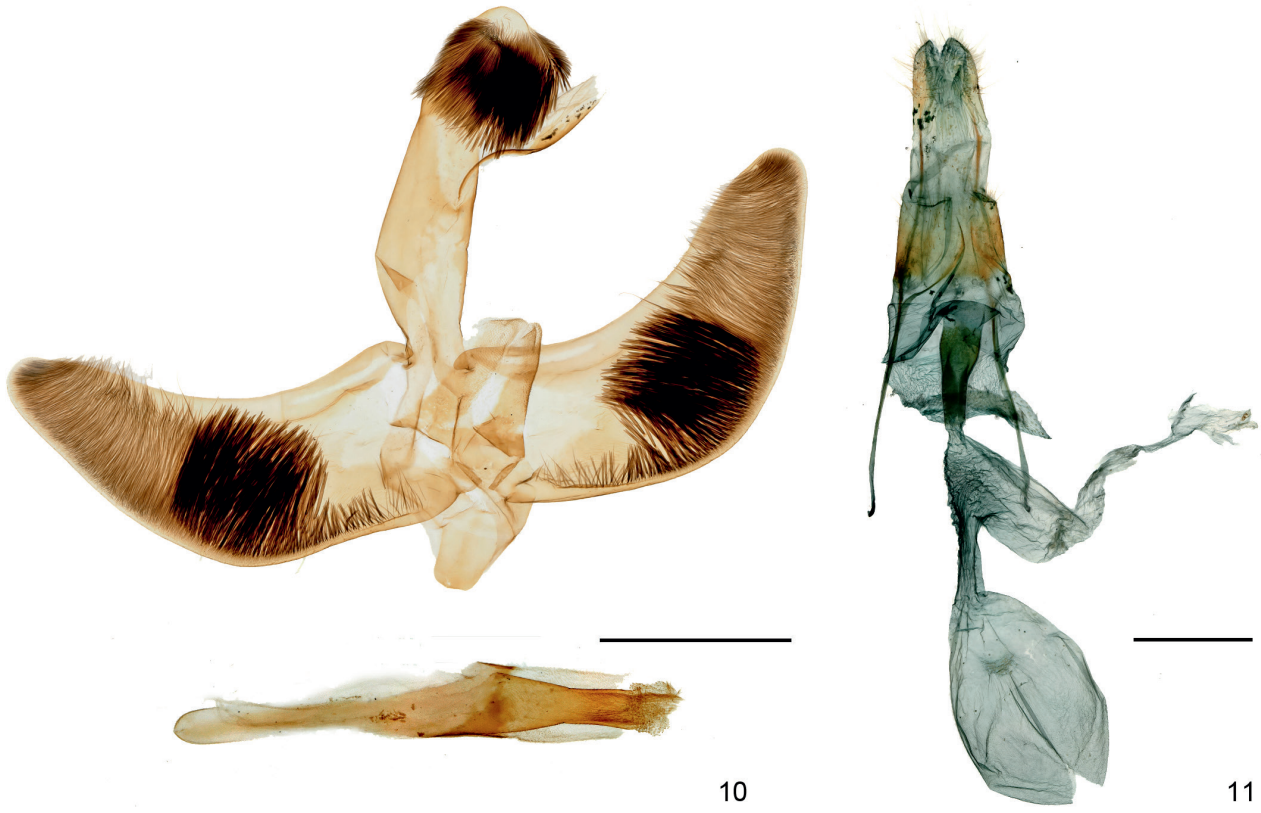
Female genitalia

Papilla analis and segment eight short, weakly sclerotized, with short setae; lamella antevaginalis and postvaginalis membranous; both pairs of apophyses of the same length; ostium bursae membranous, located between segments 7 and 8; antrum short, slightly funnel-shaped, sclerotized; ductus seminalis strongly broadened in basal half; ductus bursae narrow, with dense, irregular longitudinal folds; corpus bursae nearly round with narrow, weakly sclerotized signum.

Diagnosis

Spatenkana Bartsch, **gen. n.** is defined as follows: (1) male antenna clavate, ciliate; (2) haustellum (= proboscis) present; (3) hindwing with vein M_2 arising from costal one third of discal vein, M_3 and CuA_1 from common point; (4) uncus densely covered with setae; (5) gnathos absent; (6) valva upturned, with area of dense, long, bifurcate setae; (7) ductus seminalis strongly broadened in basal half. Character states 6 and 7 are possible synapomorphies of the genus. Another synapomorphy may be the missing gnathos. However, since a gnathos is present in most Osminiini, the absence is likely due to reduction and has evolved, most likely convergently, in other genera of the tribe such as *Halictina* Bartsch, 2016 and *Homogyna* Le Cerf, 1911 (Bartsch 2016).

Males of *Spatenkana* **gen. n.** have long, well visible ciliae on the ventral side of the antenna. Within Osmini-



Figs. 10–11. Genitalia structure of *Spatenkana dybowskii* (Le Cerf, 1917), **comb. n.** – **10**. Male. **11**. Female. Scale bars: 1 mm.

Table 1. Comparison of pairwise genetic distances between species of the tribe Osminiini and Sesiini (in %), based on COI mt-DNA barcodes (658 bp). The number of base substitutions per site from between sequences are shown. Analyses were conducted using the Kimura 2-parameter model (Kimura 1980). There were a total of 653 positions in the final dataset. The analysis was conducted in MEGA X (Kumar et al. 2018; Stecher et al. 2020).

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. *Chamanthedon melanoptera*													
2. *Echidgnathia* sp.	17.5												
3. *Halictina andraenipennis*	16.0	16.8											
4. *Heterosphecia bantanakai*	18.1	17.0	17.2										
5. *Homogyna sanguipennis*	17.0	16.3	12.1	16.4									
6. *Homogyna xanthophora*	17.8	16.4	15.5	15.8	10.2								
7. *Osminia donahueorum*	16.2	16.6	12.5	16.4	13.8	13.2							
8. *Osminia ruficornis*	15.2	14.9	14.9	15.4	13.9	14.9	9.3						
9. *Pyrophleps vitripennis*	19.3	17.3	18.0	10.0	17.4	17.4	14.1	14.5					
10. *Sazonia fenusaeformis*	16.8	17.1	12.7	16.2	16.2	15.6	10.5	10.9	15.5				
11. *Sazonia gorodinskii*	16.0	14.8	13.6	17.4	15.5	14.9	12.2	13.4	16.6	10.2			
12. *Sesia apiformis*	19.2	20.8	17.2	19.2	18.2	18.8	18.6	19.4	20.8	16.6	18.2		
13. *Spatenkana dybowskii* **comb. n.**	15.4	16.8	15.2	16.4	15.6	16.6	15.0	16.6	17.5	17.5	15.6	20.2	

ini, this feature is similar only in the genus *Cabomina* Freina, 2008, which, however, clearly differs by the more delicate shape of the body, the glossy black, sometimes orange-yellow colouration and the longer antennae, often with a white spot subapically. Bartsch (2016) discussed the antennal structure of the southern African Osminiini and pointed out that they vary greatly in length, orientation and distribution of the ciliae and are therefore only of limited use for defining the tribe. More important is the structure of the male genitalia. The male genitalia of *Spatenkana* **gen. n.** are unlike those of any other Afrotropical genus, but are somewhat similar to those of Asian genera *Heterosphecia* Le Cerf, 1916 and *Melanosphecia* Le Cerf, 1916 (Gorbunov 1988; Arita & Gorbunov 1995, 2000; Kallies 2003; Skowron et al. 2015; Skowron Volponi 2019). Representatives of these genera differ externally by their long, tufted legs, the lack of visible ciliae on the antenna and hindwing vein CuA_1 arising proximal to the discal vein. Both mentioned Asian genera have similar shapes of the vinculum, saccus, uncus and valva, but differ considerably by the presence of a gnathos, the lack of long, bifurcate setae on the valva and the longer phallus. The female genitalia structures of *Heterosphecia* and *Melanosphecia* are unknown.

Distribution

So far only known from central and southern Africa.

DNA barcoding

Besides the examination of morphological characters, we used barcoding data to verify whether *Spatenkana* **gen. n.** clusters together with other genera of the tribe Osminiini.

The results of our analysis do not contradict our morphological results, as *Spatenkana* **gen. n.** groups with other Osminiini genera but differs by more than 15% from the other available taxa (Table 1).

Etymology

The gender is feminine. This interesting genus is dedicated to our late friend and colleague Karel Špatenka, Petříkov, Czech Republic, in honour of his life's work on Sesiidae.

Spatenkana dybowskii (Le Cerf, 1917), comb. n.

(Figs. 1–5, 7, 8, 10, 11)

Albuna dybowskii Le Cerf, 1917. Le Cerf 1917: 324; Dalla Torre & Strand 1925: 169.
Paranthrene dybousci: Hampson 1919: 104 [misspelling].
Paranthrene dybowskii: Gaede 1929: 534; Heppner & Duckworth 1981: 23; Pühringer & Kallies 2004: 20.
Synanthedon dybowskii: Bartsch 2008: 278.

Material examined

Holotype (Figs. 1, 2): "1♀, Congo français [probably Gabon], ex J. Dybowski (1896), Coll. du Museum de Paris." with labels: "Mus. Paris / Congo / Dybowski / 128-96"; "Type"; "Albuna / dybowskii Le Cerf / Et.Lepid.comp., vol.14, / 1917. p. 324. Sig. no. 3938 / [P. Viette. Mars, 1951]." (MNHP).

Remarks: the specimen lacks the left antenna, the legs of the right side and the abdomen has a hole in place of the first two sternites.

Additional material: 1 ♀ (Fig. 3), Zambia, North-Western Province, Ingwe, 1400 m, 10.XII.2011, 13°03′25.4″S 26°08′02.2″E, leg. Roger Vila (Bartsch gen. prep. 2021-

03) (SMNS). 1 ♀ (Figs. 4, 5), Zimbabwe, Greenhill Bindura, 7.II.1995, flying among grass at 11:00 am, R. D. Pare (SMNS). 1 ♂ (Figs. 7, 8), Republic of South Africa, Limpopo, 8,5 km E Masisi Tshikuyu: Amelani, 380 m, 22°25′54.0″S 30°56′54.7″E, 31.I.2007, at pheromone, D. Bartsch & J. Berg leg. (Bartsch gen. prep. 2020-08) (SMNS). 1 ♀, "Rikatla P.EA, Junod III.'19, coll. Janse" [Southern Mozambique, Rikatla, about 30 km north of Maputo, III.1919, leg. Junod, collection Janse] (DNMNH).

Description of male

Alar expanse 22.5 mm, forewing 9.5 mm, antenna 6.5 mm, body 13.0 mm. Head: labial palpus covered by a mixture of black and white scales, second palpomere laterally black, long, ventral scales black; frons dark grey with weak shine, laterally broadly white; vertex glossy black; pericephalic scales white, some black scales sub-dorsally; antenna black, some pale-yellow scales on reverse side. Thorax glossy black dorsally, glossy anthracite grey laterally; patagia laterally as well as forewing base with yellow spot; some yellow scales on tegula posteriorly; posterior margin of mesothorax yellow; dorso-lateral scale tufts of metathorax grey. Foreleg: glossy anthracite grey; coxa on margins, tibia ventrally and distally and tarsus ventrally white. Midleg: femur with white hair-like scales on ventral edge; anteriorly with some yellow scales dorsally, white ventrally; tibia and tarsomeres distally with narrow white ring; tarsus ventrally and on inner side white. Hindlegs missing except hind coxa, white. Spurs of all legs dark glossy grey, reverse side white. Forewing: posterior transparent area reaching discal spot; external transparent area very large, consisting of seven cellulae, extending from vein R_3 to vein CuA_2; wing base black with some yellow scales; costal area anthracite grey; apical area blackish-brown, strongly narrowed towards tornus; veins and margins blackish-brown; discal spot slightly oblique, blackish-brown with some brown scales distally; underside on veins and margins yellow, discal spot orange-brown framed. Hindwing: veins and narrow distal margin blackish-brown; costal margin and discal spot yellow-brown, the latter with some blackish-brown scales. In both wings, membrane yellowish in distal two thirds; fringes dark grey. Abdomen: glossy black; tergites 2 and 4 densely dusted, with yellow scales in posterior half; posterior margins of tergites 2, 4–7 narrow whitish-yellow; posterior margins of sternites 2–6 whitish-yellow; anal tuft with some white scales laterally. Variation unknown.

Redescription of female

Alar expanse 22–27 mm, forewing 9.5–11.5 mm, antenna 6.0–7.0 mm, body 12.0–16.0 mm. Usually somewhat larger than male and more extensively yellow marked, as follows: anterior margin of patagia; outer and inner margins of tegula; posterior two thirds of tergites 2, 5 and 6; a lateral patch of tergite 3; tergite 4 throughout, except for a black, concave anterior area. Forewing with apical area broader and external transparent area smaller than in male, area between R_3 and R_4/R_5 usually opaque.

Genitalia (Figs. 10, 11)

As in genus description.

Variation

The holotype is more strongly yellow marked than the other examined specimens. With a 22 mm wingspan, the female from Mozambique is smaller than the other females, which measure 26–27 mm. The female from Zambia is paler than the others and has a darker forewing discal spot and external transparent area with a minute transparent cell between R_3 and R_4/R_5. Those from Zimbabwe and Mozambique have tegulae with a yellow frame, which has likely rubbed off in the other females.

Diagnosis

This species cannot be confused with any other African Sesiidae or any other Osminiini in the world. Particularly striking is the large, caudally-rounded black dorsal spot on tergites 3 and 4 of the otherwise almost completely yellow-ringed abdomen. A number of Synanthedonini are externally similar; however, all are easily distinguished based on tribe characteristics. The structure of the male genitalia resembles that of some Asian species of Osminiini; for differentiation, see genus diagnosis.

Behaviour and habitat

The only examined male appeared with a rather slow and low flight late on a sunny morning. It was attracted to a string with various synthetic pheromones attached. The habitat was a moderately grazed *Acacia* savannah with single Baobab trees. The female from Zimbabwe flew "among grass", suggesting a herbaceous host plant.

***Spatenkana africana* (Le Cerf, 1917), comb. n.**

(Figs. 6, 9)

Albuna africana Le Cerf, 1917. Le Cerf 1917: 324; Hampson 1919: 104; Dalla Torre & Strand 1925: 169; Gaede 1929: 534; Heppner & Duckworth 1981: 23; Pühringer & Kallies 2004: 20.

Synanthedon africana: Bartsch 2008: 278.

Material examined

Holotype: "1 ♀, Togoland, ex L. Conradt (1892-1893), Coll. Ch. Oberthür.", with labels: "Togoland / L.Conradt / 1892-1893"; "Type"; "Ex Collection / Ch. Oberthür / acquise en IV-1925 / par R.Biedermann"; "Albuna africana / ♀ Type Le Cerf / Et.Lep.comp.XIVp.325 fig.3938 [crossed out] / F LE CERF det.1917" (MNHP).

Taxonomic note

This species is only known from the holotype. It differs considerably from *S. dybowskii* in the general shape of the

body, especially the shorter and slightly waisted abdomen, the yellowish (not white) markings of the head and legs, the monochrome black discal spots, the lack of yellowish margins on the sternites and the entirely yellow sternite 4. The structure of the genitalia is unknown. Because of the obviously matching wing venation, it is here also transferred to *Spatenkana* **gen. n.** However, this association appears uncertain and more material is needed to test it.

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ZooBank registration: http://zoobank.org/References/351F6507-6235-4B7E-8575-B40566552D4B

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Appendix 1. List of specimens used for the calculation of genetic distances, with species, sampling site and Process ID.

Species	**Sampling Site**	**Process ID**
Pyrophleps vitripennis Arita & Gorbunov, 2000	Vietnam, Ninh Binh, Cuc Phuong	GSCMB819-12
Chamanthedon cf. *melanoptera* Le Cerf, 1927	Vietnam, Prov. Vinh Phu, Tam Dao	GSCMA1323-11
Echidgnathia Hampson, 1919 sp.	South Africa, KwaZulu-Natal, Hluhluwe	GSCMA910-11
Halictina andraenipennis (Walker, 1856)	South Africa, Free State, Sasolburg	GSCMW1270-10
Heterosphecia bantanakai (Arita & Gorbunov, 2000)	Vietnam, Ninh Binh, Cuc Phuong	GSCMA1325-11
Homogyna sanguipennis (Meyrick, 1926)	South Africa, KwaZulu-Natal, Ntinini	GSCMA908-11
Homogyna xanthophore (Hampson, 1910)	South Africa, KwaZulu-Natal, Utrecht	GSCMA909-11
Osminia donahueorum Duckworth & Eichlin, 1983	United States, Arizona, Sierra Vista	GSCMA969-11
Osminia ruficornis (Edwards, 1881)	United States, Arizona, Santa Cruz Co.	GSCMA961-11
Sazonia fenusaeformis (Herrich-Schäffer, 1852)	Turkey, Alanya, Guemueskavak	GSCMA1318-11
Sazonia gorodinskii Gorbunov & Arita, 2001	China, Yunnan, Baoshan	GSCMA695-10
Sesia apiformis (Clerck, 1759)	Spain, Andalusia, Granada	GSCMB543-12
Spatenkana dybowskii **comb. nov.**	South Africa, Limpopo, Amelani	GSCMS001-22