African Invertebrates
A journal of biodiversity research

African Invertebrates 67(1): 109–124 (2026)
DOI: 10.3897/AfrInvertebr.67.195122

Research Article

First record of *Occidentosphena ruandensis* (Rehn, 1914) in Cameroon, and re-description of *Occidentosphena uvarovi* (Rehn, 1942) (Orthoptera, Pyrgomorphidae) from the Cameroon Volcanic Line

Alain Christel Wandji[1], Jeanne Agrippine Yetchom Fondjo[2], Martin Husemann[2,3], Marcelle Mbadjoun Nziké[1], Alfiery Laurel Djomnang Nkwala[4], Cédric William Kemtchouan[1], Sévilor Kekeunou[1]

1 Laboratory of Zoology and Conservation, Faculty of Science, University of Yaoundé 1, Yaoundé, Cameroon
2 Staatliches Museum für Naturkunde Karlsruhe, Karlsruhe, Germany
3 Karlsruhe Institute for Technology, Zoology Dept., Karlsruhe, Germany
4 Research Unit of Biology and Applied Ecology, Department of Animal Biology, Faculty of Science, University of Dschang, Dschang, Cameroon
Corresponding author: Alain Christel Wandji (wandjichristel@gmail.com)

Abstract

Occidentosphena Kevan, 1956 is an Afrotropical grasshopper genus that currently comprises two described species, namely *Occidentosphena ruandensis* (Rehn, 1914) and *Occidentosphena uvarovi* (Rehn, 1942). This study reports the first occurrence of *O. ruandensis* in Cameroon based on specimens collected on Mt. Manengouba. The species was previously known only from the Eastern Afromontane region and Lake Kivu in the Democratic Republic of Congo. This new finding significantly expands the known distribution of the genus *Occidentosphena* into West and Central Africa. We also provide re-descriptions of both species based on material collected in the Cameroon Volcanic Line, and present detailed descriptions of the male genitalia of both taxa for the first time. Additionally, we clarify the diagnostic traits for the two species based on external morphological characters and male genital structures. Overall, our results improve the biogeographical knowledge and taxonomic resolution of this poorly known genus.

Key words: Distribution range, gaudy grasshoppers, montane ecosystems, Pyrgomorphid grasshoppers, genitalia, taxonomy

OPEN ACCESS

Academic editor: Adrian Armstrong
Received: 10 April 2026
Accepted: 19 June 2026
Published: 30 June 2026

ZooBank: https://zoobank.org/DD09EA6F-058E-4A64-B66B-699277585632

Citation: Wandji AC, Yetchom Fondjo JA, Husemann M, Mbadjoun Nziké M, Djomnang Nkwala AL, Kemtchouan CW, Kekeunou S (2026) First record of *Occidentosphena ruandensis* (Rehn, 1914) in Cameroon, and re-description of *Occidentosphena uvarovi* (Rehn, 1942) (Orthoptera, Pyrgomorphidae) from the Cameroon Volcanic Line. African Invertebrates 67(1): 109–124. https://doi.org/10.3897/afrinvertebr.67.195122

Introduction

The Cameroon Volcanic Line represents one of the most significant montane systems in West and Central Africa, supporting a high level of biodiversity and endemism (Myers et al. 2000; Tchassem et al. 2021; Kameni et al. 2022). Despite this, the grasshopper fauna of these highlands remains comparatively underexplored, especially when contrasted with the better-studied Eastern Afromontane region (Hemp and Hemp 2003; Hemp et al. 2009).

The genus *Occidentosphena* represents a little-known group of African Pyrgomorphids, with poorly documented diversity and distribution, particularly in

West and Central Africa. Currently, the genus consists of two species, namely *Occidentosphena ruandensis* (Rehn, 1914) and *Occidentosphena uvarovi* (Rehn, 1942), which are generally found in montane ecosystems, where geographic isolation and habitat specialization often lead to endemism and diversification (Dirsh 1965; Hemp et al. 2009).

Occidentosphena ruandensis was originally described as *Parasphena ruandensis* by Rehn (1914) based on the external morphology of female specimens. For several years, following its original description, this species was consistently considered to be a typical representative of the genus *Parasphena*. Kevan (1956), undertook a revision of the African Pyrgomorphinae, and erected the genus *Occidentosphena* to which *P. ruandensis* was transferred. Under this new combination, the species became *Occidentosphena ruandensis*, a name subsequently adopted by many researchers like Dirsh (1965) and Johnston (1968).

Occidentosphena uvarovi was originally described by Rehn (1942) as belonging to the genus *Parasphena*, but this description was based solely on male specimens. Chopard (1945) described the species as *Parasphena granulata*, based on female specimens. However, this was later synonymized with *P. uvarovi* by Kevan (1956) and Johnston (1968), although Kevan (1956) transferred it to the newly erected genus *Occidentosphena*. Since Kevan's revision, the combination *Occidentosphena uvarovi* has been adopted.

Occidentosphena ruandensis (Rehn, 1914) has so far been considered restricted to East Africa and the Democratic Republic of Congo, with records primarily from the Lake Kivu and Albertine Rift regions (Rehn 1942). No further confirmed occurrences of this species have previously been documented in West or Central Africa. *Occidentosphena uvarovi* (Rehn, 1942) currently is known from Cameroon, Congo, and Gabon (Tchibozo and Lecoq 2017; Mestre and Chiffaud 2023). However, its original description remains incomplete, and several diagnostic characters now require clarification, which can be addressed using newly collected material. Moreover, species identification within *Occidentosphena* remains challenging, as previous taxonomic classifications relied solely on external morphology and lacked detailed comparative analyses of stable diagnostic traits, particularly those of the male genitalia. It is also unclear whether the apparent restriction of *O. ruandensis* to Lake Kivu and the Albertine Rift reflects a true biogeographic pattern or is simply the result of limited sampling across West and Central African montane regions. Despite their potential biogeographic significance, records of *Occidentosphena* species are extremely scarce with few documented specimens from a limited number of countries. This highlights the need for further surveys and a taxonomic revision (Dirsh 1965; Cigliano et al. 2026).

In this study, we provide the first record of *O. ruandensis* from Cameroon and present a re-description of *O. uvarovi* based on newly collected material from Mts. Manengouba and Bamboutos, respectively. To facilitate the distinction between the two species, a new diagnostic trait is presented.

Materials and methods

Study sites

This study was carried out from July 2025 to February 2026 on two mountains of the Cameroon Volcanic Line: Mt. Bamboutos (5°41'05"N, 10°06'23"E;

2440 m a.s.l.) and Mt. Manengouba (5°00'33"N, 9°51'18"E; 2144 m a.s.l.). These mountains are located in the West and Littoral/Southwest regions of Cameroon, respectively (Fig. 1). They are recognized for their significant biodiversity and endemism, categorizing them as biodiversity hotspots (Couvreur et al. 2021). Mt. Bamboutos features gallery forests and mountain grasslands, which have been largely transformed into agricultural fields, eucalyptus plantations, and pastures (Tchassem et al. 2021). The mean annual rainfall is 1,918 mm and the average annual temperature at the summit is 18.9 °C (Kengni et al. 2009). In contrast, Mt. Manengouba supports a well-developed montane forest up to the Eboga Caldera at an elevation of approximately 2100 to 2300 m a.s.l., along with mountain grassland extending to the summit. This mountain receives an average annual rainfall of 2,684 mm, with a mean annual temperature of 19 °C at its peak (Suchel 1988; Gonwouo et al. 2006). In addition to the Cameroonian localities surveyed in this study, previously documented occurrence records from the Democratic Republic of Congo, the Republic of Congo, and Gabon were included in the distribution map to improve our understanding of the species' known distribution range.

Methodology

Grasshopper sampling and morphological identification

Regular sampling was conducted monthly, and grasshoppers were collected using sweep nets (Launois 1979). Target species were collected for 60 minutes per sampling day between 10 a.m. and 4 p.m. (Yetchom Fondjo et al. 2020). They were searched in gallery forests and agricultural fields. Photographs in the natural habitat were made using a digital camera (OM SYSTEM TG-7, Olympus, Japan). Geographical coordinates were recorded in decimal degrees format using the WGS84

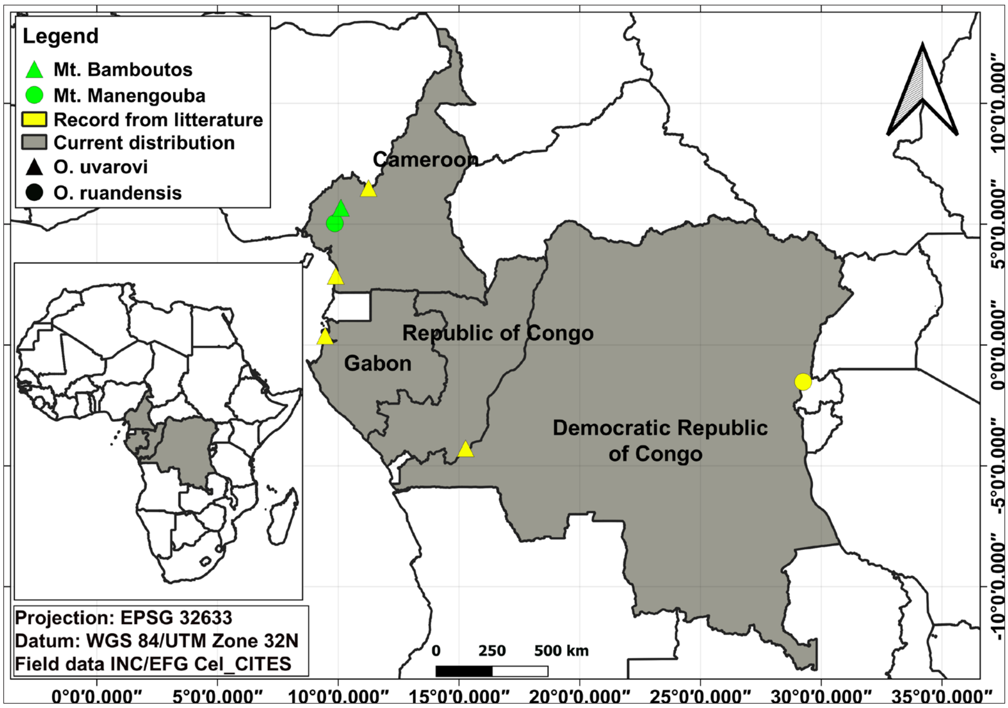

Figure 1. Distribution map of the genus *Occidentosphena*, based on historical records and newly documented occurrences in Cameroon.

coordinate system with a GPS device (Garmin GPSMAP 64s, USA). Specimens were preserved in 95% ethanol and transported to the Laboratory of Zoology of the University of Yaoundé 1 (LZUY1) for later examination and identification.

Identifications were made under a stereo-microscope (Wild Heerbrugg, Switzerland) using the identification keys of Dirsh (1965) and Rehn (1942). Ethanol-preserved specimens were subsequently photographed in frontal, lateral, and dorsal views at the State Museum of Natural History Karlsruhe, Germany (SMNK) using a Keyence VHX-7000 digital microscope (Keyence, London, UK). Dissections and preparations of male genitalia followed the standard methodologies of Kevan et al. (1969) and Martinelli et al. (2017). Photographs of male genitalia were also obtained with the Keyence VHX-7000 digital microscope. Terminology of male genitalia is consistent with the conventions established by Dirsh (1970), Kevan et al. (1974), and Rowell (2013).

Measurements (Table 1) were taken with digital calipers (NEICO, USA) to the nearest 0.1 mm; we measured head length (HL), head width (HW), antenna length (AL), interocular distance (IOD), pronotum length (PL), pronotum width (PW), hind tibia length (HTL), hind femur length (HFL), hind femur width (HFW) and body length (BL). The number of antennal segments (NA) were counted.

Data analysis

The mean values and standard errors (SE) were calculated for each morphometric character for both species, for males and females. The normality of the data was evaluated using the Shapiro-Wilk test. Interspecific comparisons were then conducted using either a Student's t-test for normally distributed variables or a Mann-Whitney U test for non-normally distributed variables, depending on the distribution of the data. Male and female specimens were analyzed separately. All statistical analyses were conducted using PAST version 4.17, with statistical significance assessed at the 5% level.

Depositories

ANSP Academy of Natural Sciences of Philadelphia, United States;
MfN Museum für Naturkunde Berlin, Germany;
SMNK State Museum of Natural History Karlsruhe, Germany.

Results

A total of 22 individuals representing two species of the genus *Occidentosphena* were collected for this study: *O. uvarovi* (8 individuals) and *O. ruandensis* (14 individuals). Measurements and counts are presented in Table 1.

Re-description of two species of the genus the *Occidentosphena*

***Occidentosphena ruandensis* (Rehn, 1914)**
Figs 2, 3

Holotype. Democratic Republic of the Congo • 1♀; Nord-Kivu, Niragongo, Lake Kivu; alt. 3000 m; 05 October 1907; Harzog, Adolf & Mecklenburg leg.; MfN.

Table 1. Measurements in millimeters (mm) of *Occidentosphena uvarovi* and *Occidentosphena ruandensis*. HL: head length; HW: head width; AL: antenna length; IOD: interocular distance; PL: pronotum length; PW: pronotum width; HTL: hind tibia length; HFL: hind femur length; HFW: hind femur width; BL: body length. NA: number of antenna segments.

Sex	Male						Female					
Species	*Occidentosphena uvarovi*		*Occidentosphena ruandensis*				*Occidentosphena uvarovi*		*Occidentosphena ruandensis*			
Parameters	Range	Mean ± SE (N)	Range	Mean ± SE (N)	Test	p-value	Range	Mean ± SE (N)	Range	Mean ± SE (N)	Test	p-value
HL	3.05–3.28	3.2 ± 0.08 (N = 3)	2.62–2.96	2.76 ± 0.06 (N = 5)	U = 2.1	0.04*	3.1–3.47	3.25 ± 0.11 (N = 3)	3.12–3.55	3.27 ± 0.14 (N = 3)	t = 0.13	0.90
HW	1.62–2.07	1.86 ± 0.13 (N = 3)	1.68–1.95	1.83 ± 0.05 (N = 5)	t = 0.25	0.81	2.05–2.29	2.14 ± 0.07 (N = 3)	2.01–2.26	2.14 ± 0.07 (N = 3)	t = 0	1
NA	15–15	15 ± 0 (N = 2)	13–14	13.5 ± 0.5 (N = 2)	-	-	-	16 (N = 1)	-	15 (N = 1)	-	-
AL	4.97–4.98	4.98 ± 0.01 (N = 2)	5.89–5.97	5.93 ± 0.04 (N = 2)	-	-	-	5.71 (N = 1)	-	5.58 (N = 1)	-	-
IOD	0.65–0.72	0.69 ± 0.02 (N = 3)	0.52–0.74	0.66 ± ± 0.04 (N = 5)	t = 0.73	0.49	0.82–1.1	0.94 ± 0.08 (N = 3)	0.86–0.89	0.88 ± 0.01 (N = 3)	t = 072	0.52
PL	3.01–3.08	3.05 ± 0.02 (N = 3)	2.51–2.75	2.62 ± ± 0.04 (N = 5)	t = 7.14	< 0.001***	3.64–4.54	4.19 ± 0.28 (N = 3)	3.63–4.03	3.78 ± 0.12 (N = 3)	t = 1.33	0.26
PW	3.48–3.72	3.57 ± 0.08 (N = 3)	2.77–3.06	2.92 ± 0.05 (N = 5)	t = 7.82	< 0.001***	4.72–5.33	5.1 ± 0.19 (N = 3)	4.73–5.07	4.93 ± 0.1 (N = 3)	t = 77	0.48
HTL	7.83–7.99	7.91 ± 0.05 (N = 3)	7.32–8.16	7.79 ± 0.17 (N = 4)	t = 0.60	0.58	9.19–10.37	9.87 ± 0.35 (N = 3)	9.04–9.84	9.44 ± 0.4 (N = 2)	t = 0.79	0.49
HFL	8.5–8.77	8.68 ± 0.09 (N = 3)	8.39–8.69	8.55 ± 0.08 (N = 4)	t = 1.09	0.33	10.39–11.53	11.07 ± 0.35 (N = 3)	10.05–11.05	10.78 ± 0.28 (N = 2)	t = 0.59	0.59
HFW	1.29–1.39	1.33 ± 0.03 (N = 3)	1.24–1.27	1.26 ± 0.007 (N = 4)	t = 2.60	0.05	1.4–1.76	1.59 ± 0.1 (N = 3)	1.51–1.61	1.56 ± 0.05 (N = 2)	t = 0.24	0.83
BL	11.83–15.97	14.53 ± 1.35 (N = 3)	13.49–15.78	14.69 ± 0.37 (N = 5)	t = 0.14	0.89	21.74–25.1	23.56 ± 0.98 (N = 3)	20.66–24.61	22.06 ± 1.28 (N = 3)	t = 0.93	0.40

Legend. Mean: average value of the different body parts; SE: standard error; N: number of individuals; U: value of Mann Whitney test and t: value of Students test used to compare the mean measurements of males and females of both species; p: probability, *: significant; ***: highly significant. Statistical comparison was not performed on parameters represented by only one or two measurements due to insufficient sample size.

Examined material. Cameroon • 9♂, 5♀; Littoral region, Mt. Manengouba; 5°1'57.48"N, 9°51'19.42"E; alt. 2058 m a.s.l.; 29 September 2025; A.C. Wandji & M. Mbadjoun Nziké leg.; Gallery forest; sweep net; SMNK.

Diagnosis. Fastigial furrow distinctly narrow and slightly incurved; median carina of the pronotum weakly developed on the prozona; lateral carina weakly pronounced; sparse granules on the pronotum and lateral margin of the thorax; lophi with bilobed apex; apodemal plate ovoid in lateral view, lobes strongly produced ventrally with rounded apex and fairly close to each other; valves of cingulum well developed in ventral view and extend beyond the sheath of ectophallus; dorsal cleft of cingulum covered by the aedeagal valves, ventral cleft narrow; sheath well-developed, apex nearly straight; ventral process of cingulum broadly covering the endophallic apodemes in ventral view; general body coloration green in both male and female; eyes black without two large basal white spots; all legs and ovipositor light green in female; in male, femora yellowish to yellowish green except bluish distally, other leg segments blue to green.

Re-description. Male: Integument finely rugose with scattered or dispersed granules. Antennae thick, filiform, shorter than the head and pronotum combined. Fastigium of vertex subtriangular, slightly longer than the interocular distance, apex slightly rounded; fastigial furrow narrow and deeply impressed. Frons strongly oblique and incurved; frontal ridge between antennae compressed, with a slit-like sulcus, almost obliterated, with traces of lateral carinulae. Sparse granules on the pronotum and lateral margin of the thorax; pronotum subcylindrical, widening posteriorly, lateral lobes considerably longer than wide; median carina linear, crossed by three sulci, weakly developed on the prozona and indistinct on the metazona; lateral carinae thicker and more pronounced than the median carina; metazona about one-third the length of the prozona. Tegmina and wings absent; tympanum present. Hind femur slender, with a slightly expanded lower marginal area not visible from above. Hind tibiae slightly shorter than the femora, with six to seven spines on the outer margin and ten spines on the inner margin; external apical spine of the hind tibia present. Cercus short, conical. Subgenital plate with an almost rounded apex, bearing a mid-longitudinal furrow (Fig. 2E–G).

Female: Similar to male, but larger with body length ranging from 20.66 to 24.61 mm in females versus 13.49 to 15.78 mm in males. Ovipositor long and compressed, with valves almost straight, curved outward at the tips (Fig. 2A–C).

Coloration. Predominantly green in both male and female; pro-, meso-, and metathoracic segments purple ventrally; abdomen whitish in females and bluish in males; antennae scape and pedicel purple, flagellum dark or pale; eyes black, with two large white spots on the basal part. All femora, tibiae and tarsi green in female; in male, femora yellowish to yellowish green except bluish distally, other leg segments blue to green; ovipositor valves light green with yellowish apices (Fig. 2D, H).

Epiphallus. Bridge broad and wide, anterior margin curved emarginate, posterior margin weakly incurved; ancorae absent; anterior projections large, prominent and divergent with obtuse angular apices; appendices narrow and divergent, each apical lobes bearing two processes, one smaller and the other broader; lateral plates almost parallel, with external margins expanded; lophi large, antero-laterally directed with bilobated apex (Fig. 3A).

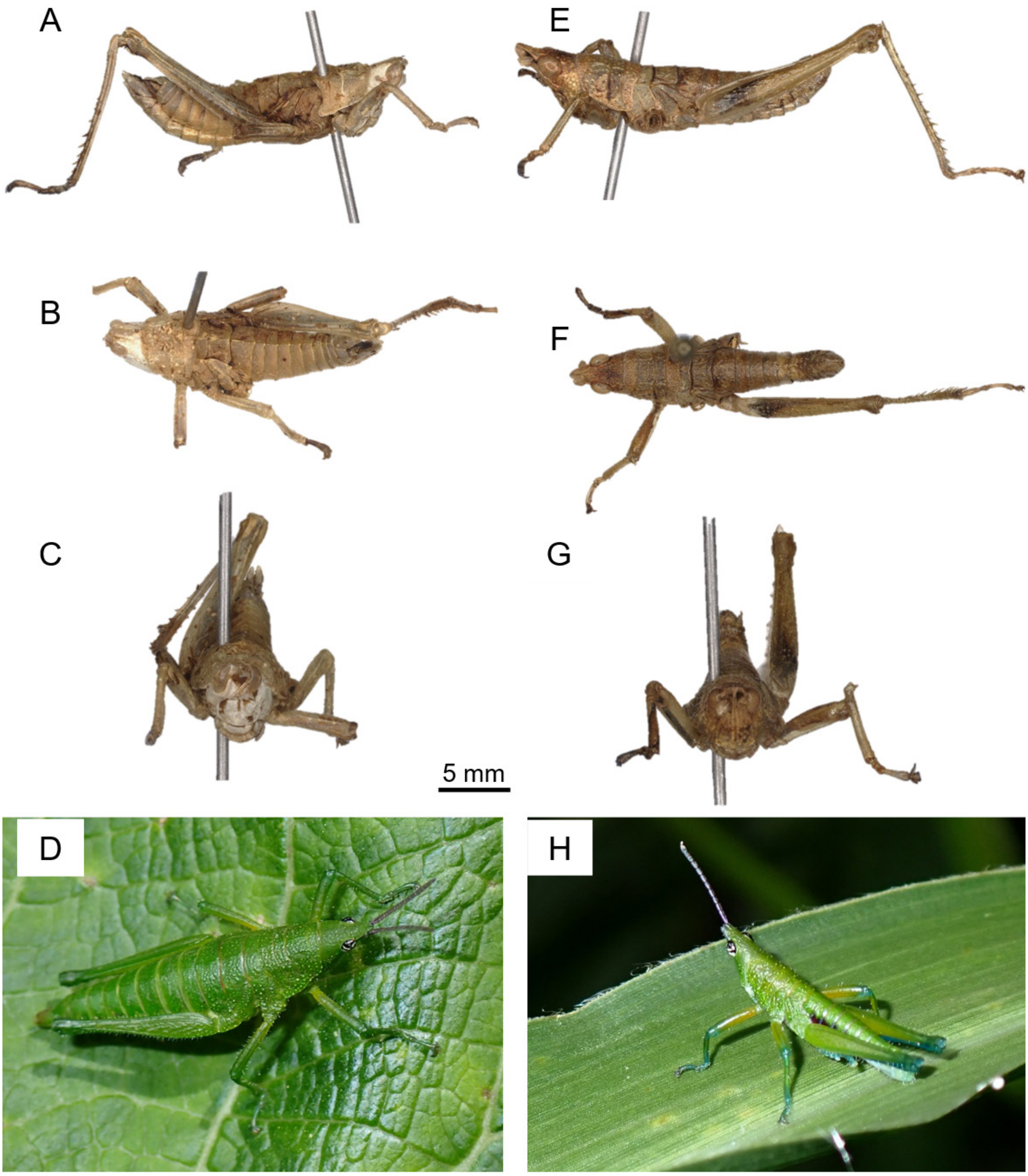

Figure 2. *Occidentosphena ruandensis*. **A–D.** Female in lateral, dorsal and frontal views and in its naturel habitat; **E–H.** Male in lateral, dorsal and frontal views and in its naturel habitat. Scale bar: 5 mm.

Phallic complex. Central membrane narrow; zygoma narrow; suprazygomal plate rounded, narrow, much shorter than the zygoma; apodemal plate broad and ovoid in lateral view, with lobes strongly produced ventrally with rounded apex and fairly close to each other; valves of cingulum very small, narrow, and pointed in lateral view, and extending beyond the sheath of ectophallus; visible section of rami of cingulum narrow in dorsal view; dorsal cleft of cingulum cov-

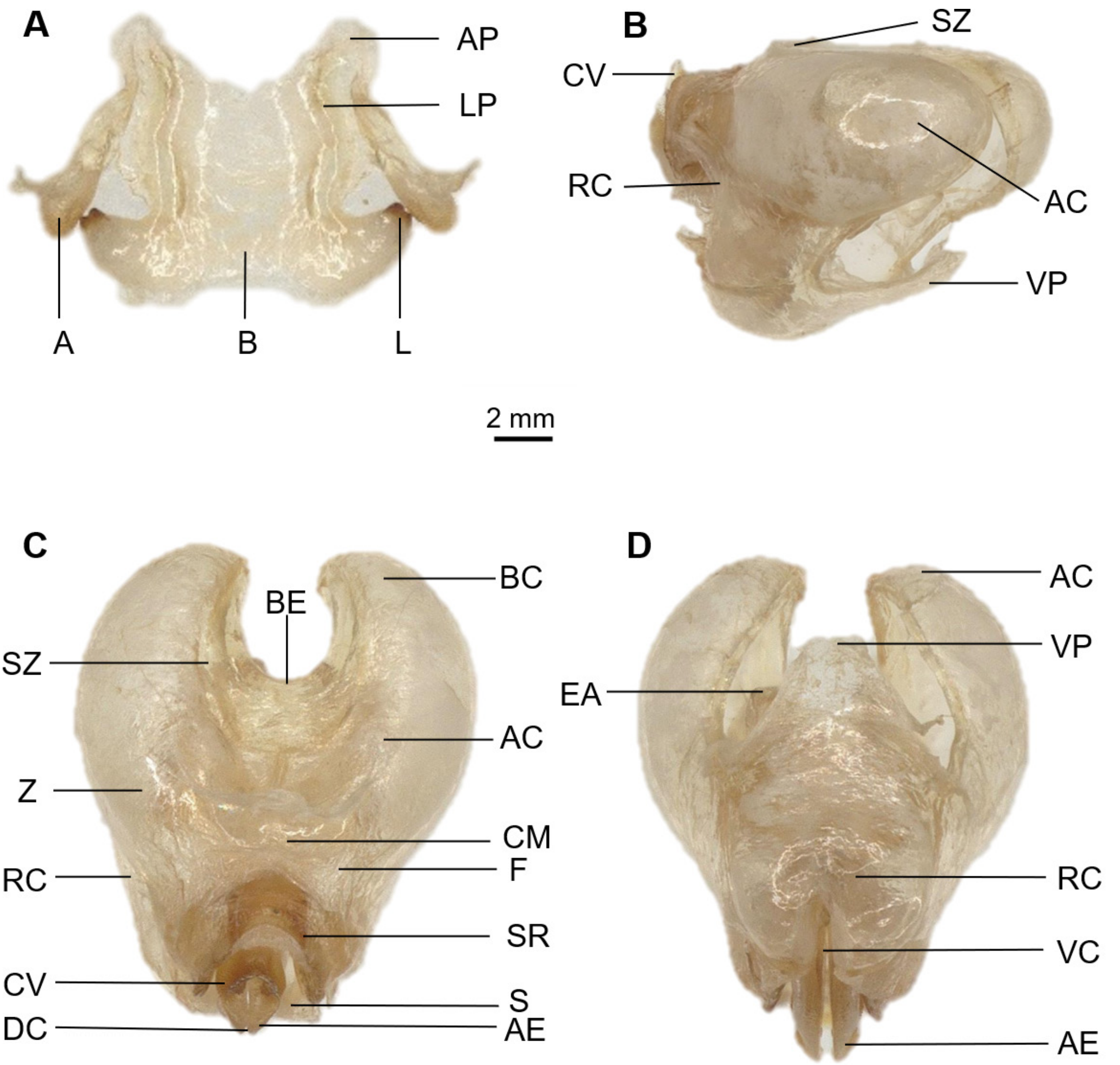

Figure 3. Phallic structures of *Occidentosphena ruandensis*. **A.** Epiphallus in dorsal view; **B.** Ectophallus + Endophallus in lateral view; **C.** Ectophallus + Endophallus in dorsal view; **D.** Ectophallus + Endophallus in ventral view. A: appendices; AC: apodemal plate of cingulum; AE: aedeagus (aedeagal valves); AP: anterior projection of epiphallus; B: bridge of epiphallus; BC: basal thickening of cingulum; BE: basal emargination of cingulum; CM: central membrane of epiphallus; CV: valve of cingulum; DC: dorsal cleft of cingulum; EA: endophallic apodeme; F: marginal furrow separating suprarami and rami of cingulum; L: lophus of epiphallus; LP: lateral plate of epiphallus; RC: ramus of cingulum; S: sheath of ectophallus; SR: supraramus of cingulum; SZ: suprazygomal plate of cingulum; VC: ventral cleft of cingulum; VP: ventral process of cingulum; Z: zygoma of cingulum. Scale bar: 2 mm.

ered by the aedeagal valves, ventral cleft narrow; suprarami well developed and large; basal emargination of cingulum very deep, parabolic, rounded; sheaths well-developed, apex nearly straight; ventral process of cingulum large, partly covering the endophallic apodemes and markedly projecting beyond them in ventral view, not reaching the basal thickening of cingulum, and not visible in dorsal view; aedeagal valves well-developed, of medium size, with pointed apices, extending beyond the tip of the sheath of ectophallus in ventral view and slightly in the dorsal view (Fig. 3B–D).

Ecological notes. *Occidentosphena ruandensis* was collected at an altitude of 2,143 meters during the rainy season. It was found in an open herbaceous area on the edge of a montane gallery forest, close to a small permanent stream.

Occidentosphena uvarovi (Rehn, 1942)

Figs 3, 4

Holotype. Cameroon • 1♂; Cameroon Mountains, N'tem Ebene; alt. 2000 m; 31 December 1908; Riggenbach leg.; ANSP.

Examined material. Cameroon • 5♂, 3♀; West region, Mt. Bamboutos; 5°41'5.37"N, 10°6'22.54"E; alt. 2440 m a.s.l.; 31 July 2025; A.C Wandji & C.W Kemtchouan leg.; agricultural field; sweep net; SMNK.

Diagnosis. Fastigial furrow narrow and deep; median carina of the pronotum well developed on the prozona in female, weaker and less conspicuous in males; lateral carinae present, distinctly developed on the prozona, weakly developed on the meso- and metazona, but more pronounced in females than in males; scattered to dense granules on the pronotum and lateral margin of the thorax; lophi with acute apex; apodemal plate rounded in lateral view, lobes strongly produced ventrally with acute apex; valves of cingulum not visible in ventral view; dorsal cleft of cingulum large, ventral cleft fairly broad and V-shaped; sheath well-developed, apex rounded; ventral process of cingulum broadly expanded, entirely covering the endophallic apodemes in ventral view; general body coloration light green in females and brown in males; eyes grey with two horizontal white bands; fore and hind legs of the male predominantly brown; fore and mid femora brown or burgundy, hind femur greenish to yellowish, and hind tibia and ovipositor burgundy in the females.

Re-description. Male: Integument finely rugose with scattered or dispersed granules. Antennae thick, filiform, shorter than the head and pronotum combined. Fastigium of vertex subtriangular, slightly longer than the interocular distance, apex slightly rounded; fastigial furrow narrow and deeply impressed. Frons strongly oblique and incurved; frontal ridge between antennae compressed, with a slit-like sulcus, almost obliterated, with traces of lateral carinulae. Pronotum subcylindrical, widening posteriorly, lateral lobes considerably longer than wide; median carina linear, crossed by three sulci, distinct on the prozona and indistinct on the metazona; lateral carinae on the prozona curved inward in front of the first transverse sulcus and outward behind it; metazona about one-third the length of the prozona. Tegmina and wings absent; tympanum present. Hind femora slender, with a slightly expanded lower marginal area not visible from above; genicular lobes pointed. Hind tibiae slightly shorter than the femora, with six to seven spines on the outer margin and ten spines on the inner margin; external apical spine of the hind tibia present. Cercus short, conical. Subgenital plate triangular with an almost rounded apex, bearing a mid-longitudinal furrow (Fig. 4E–G).

Female: Similar to male, but larger with body length ranging from 21.74 to 25.1 mm in females versus 11.83 to 15.97 mm in males. Ovipositor long and compressed, with valves almost straight, curved inwards at the tips (Fig. 4A–C, E–G).

Coloration. Predominantly brown in males with whitish granules. Antennae dark grey in the male and brown in the female; eyes grey with two horizontal

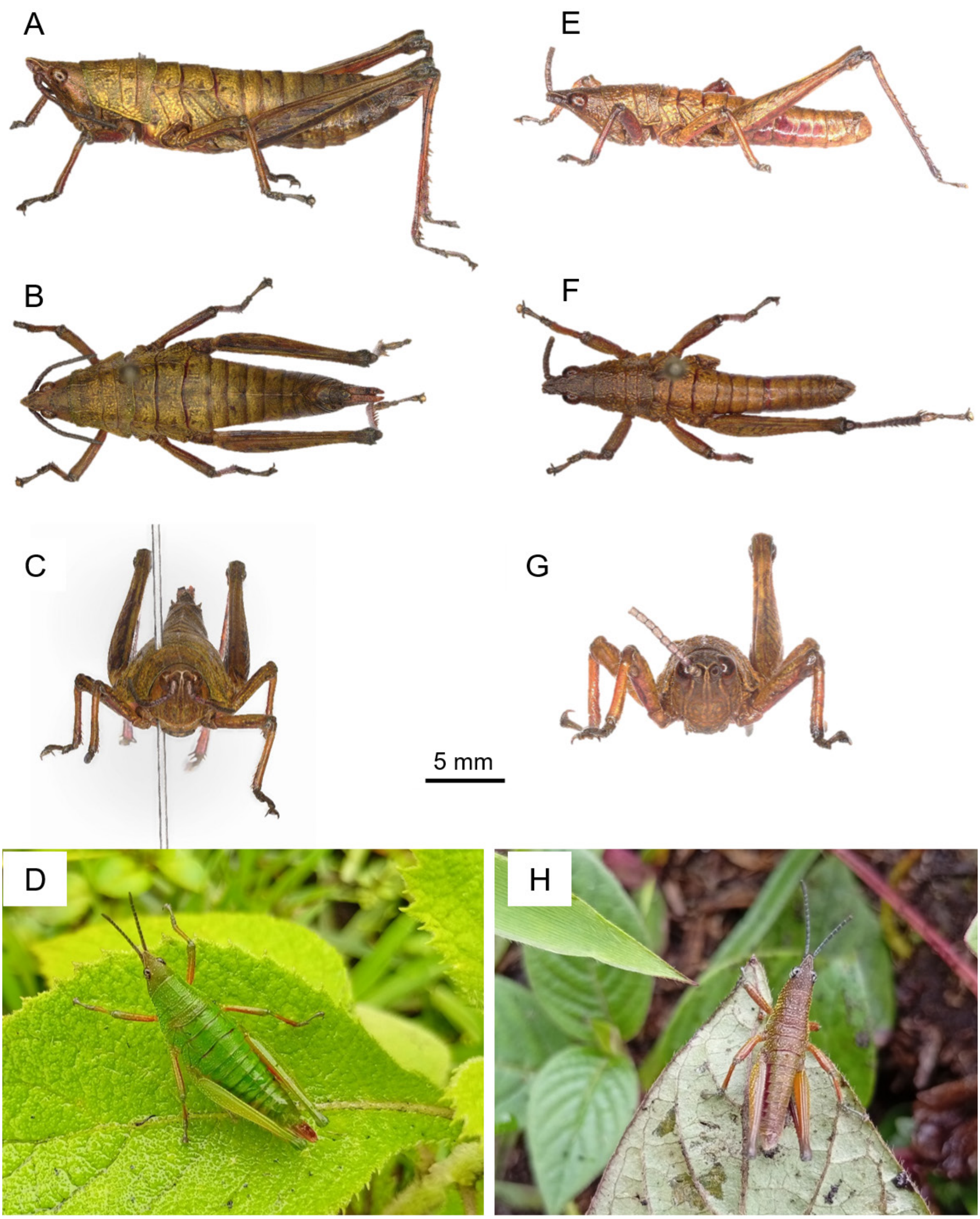

Figure 4. *Occidentosphena uvarovi*. **A–D.** Female in lateral, dorsal and frontal views and in its naturel habitat; **E–H.** Male in in lateral, dorsal and frontal views and in its naturel habitat. Scale bar: 5 mm.

white bands and two white spots on the anterior part, although these are absent in some individuals; a longitudinal line of whitish granules extending from the base of the eyes to the posterior margin of the lateral lobe of the pronotum. In males, the fore, middle, and hind legs are predominantly brown. Female are predominantly light green with brown or burgundy fore and middle femora; the hind femora are yellowish-green; the hind tibia and ovipositor are reddish (Fig. 4D, H).

Epiphallus. Bridge broad, compressed, its anterior margin strongly curved, emarginate, posterior margin fairly incurved; ancorae absent; anterior projections large, prominent, and divergent with rounded apex; appendices broad and divergent, each apical lobe bearing two processes, one smaller and the other broader; lateral plates convex, divergent, with external margins expanded; lophi short, unilobate, antero-laterally directed with obtuse angular apex (Fig. 5A).

Phallic complex. Central membrane narrow; zygoma broad; suprazygomal plate rounded, narrow, and much shorter than the zygoma; apodemal plate

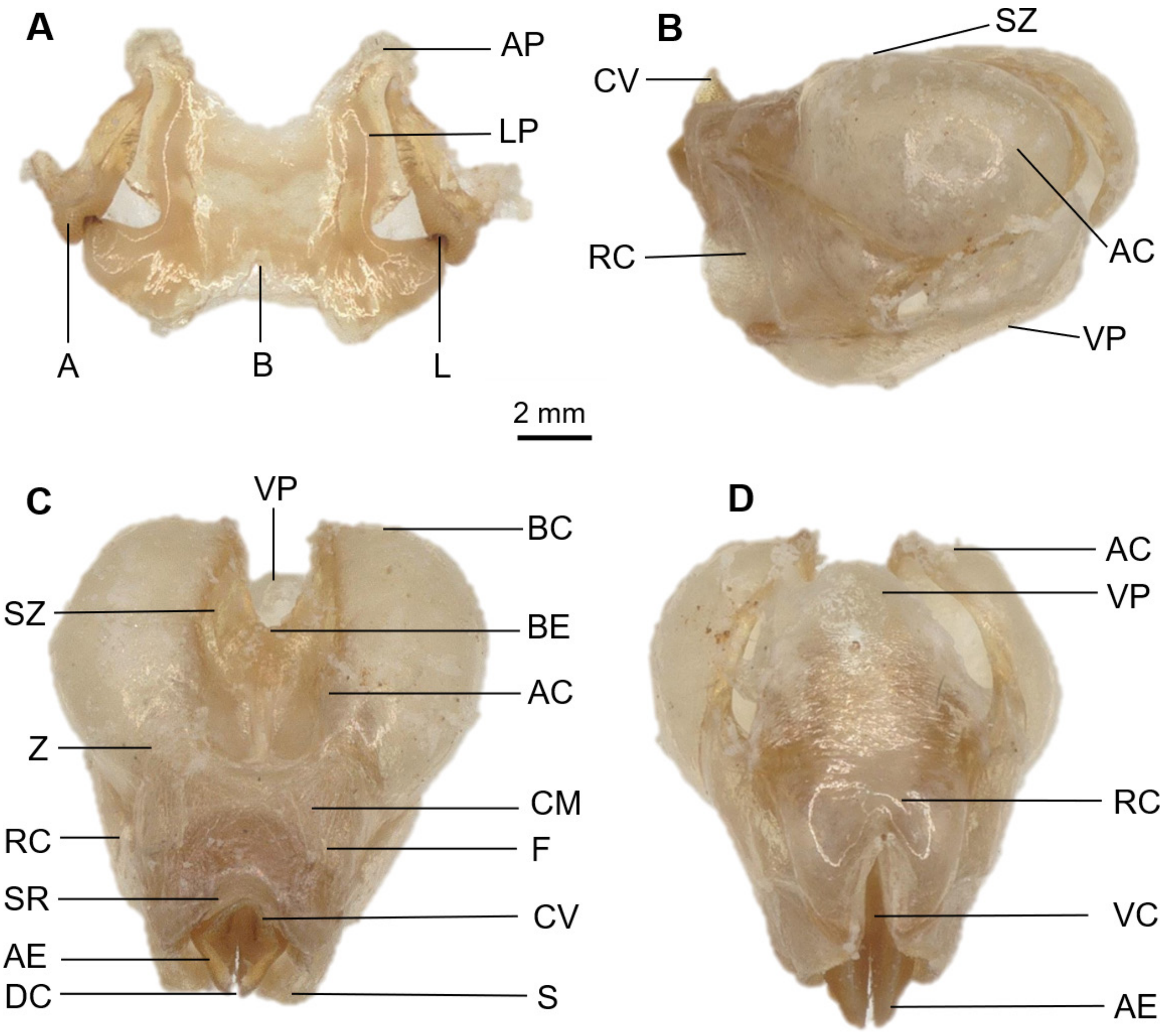

Figure 5. Phallic structures of *Occidentosphena uvarovi*. **A.** Epiphallus in dorsal view; **B.** Ectophallus + Endophallus in lateral view; **C.** Ectophallus + Endophallus in dorsal view; **D.** Ectophallus + Endophallus in ventral view. A: appendices; AC: apodemal plate of cingulum; AE: aedeagus (aedeagal valves); AP: anterior projection of epiphallus; B: bridge of epiphallus; BC: basal thickening of cingulum; BE: basal emargination of cingulum; CM: central membrane of epiphallus; CV: valve of cingulum; DC: dorsal cleft of cingulum; F: marginal furrow separating suprarami and rami of cingulum; L: lophus of epiphallus; LP: lateral plate of epiphallus; RC: ramus of cingulum; S: sheath of ectophallus; SR: supraramus of cingulum; SZ: suprazygomal plate of cingulum; VC: ventral cleft of cingulum; VP: ventral process of cingulum; Z: zygoma of cingulum. Scale bar: 2 mm.

broad and rounded in lateral view, with lobes strongly produced ventrally and an acute apex; valves of cingulum large and divergent in dorsal view; rami of cingulum narrow in dorsal view; dorsal cleft of cingulum narrow and ventral cleft broader in comparison with those of *O. ruandensis*; suprarami well developed and large; basal emargination of cingulum very deep, narrow, and V-shaped; sheath well-developed, with rounded apex; ventral process of cingulum well-developed, entirely covering the endophallic apodemes in ventral view, reaching the basal thickening of cingulum, and extending beyond the basal emargination of cingulum, also clearly visible in dorsal view; aedeagal valves well developed and large with pointed apices, extending well beyond the tip of the sheath of ectophallus in both dorsal and ventral views (Fig. 5B–D).

Ecological notes. *Occidentosphena uvarovi* was found at an altitude of 2,440 meters in an agricultural field during the rainy season.

Discussion

The genus *Occidentosphena* Kevan, 1956, with *Parasphena ruandensis* as a type species, is an Afrotropical grasshopper genus currently including only two described species. Prior to this study, only *O. uvarovi* (Rehn, 1942) was reported from Cameroon (Rehn 1942; Dirsh 1965). The record of this species during the present study confirms that it still occurs in the country. It was previously reported in mountainous habitats (Mt. N'tem Ebene and Mt. Bamboutos) by Rehn (1942), Chopard (1945), and Dirsh (1965). For several decades, it was considered a restricted taxon, apparently endemic to the Cameroonian highlands and adjacent habitats. However, Tchibozo and Lecoq (2017), in their review of "Edible Orthoptera from Africa", reported the presence of *O. uvarovi* in Congo and Gabon, based on local knowledge. These records considerably extend the species' previously known range southeastwards into the forest of the Congo Basin. This broader distribution may reflect a wider geographical range that had previously gone undetected, likely due to limited sampling of orthopterans in large parts of West and Central Africa, particularly outside of Cameroon (Yetchom Fondjo et al. 2025a).

The second species, *O. ruandensis* (Rehn, 1914) had hitherto only been found in the Democratic Republic of Congo and in the Albertine Rift Eastern Montane regions (Rehn 1914; Hemp et al. 2009). The present record represents the first confirmed occurrence of *O. ruandensis* in Cameroon, which significantly expands its known distribution, along the Cameroon Volcanic Line. This finding could suggest two possible scenarios: (1) *O. ruandensis* exhibits a fragmented distribution with isolated populations, or (2) the species historically had a broader range, but climatic and environmental changes have led to population fragmentation and isolation. Our finding is consistent with the suggestion that many Afrotropical montane species have highly fragmented distributions due to recent anthropogenic habitat destruction (including agricultural expansion, pesticide use, and pastoral activities in the study area), the natural patchiness of suitable habitats, or historical climatic and geological events that have disrupted continuous populations (Saunders et al. 1991; Lindenmayer and Fischer 2006). Similar biogeographical patterns have been observed in other orthopteran groups, such as *Afroanthracites discolor* Hemp, Ingrisch & Ünal, 2013 and *Horatosphaga nou* Hemp, 2006 (Ribera and Blasco-Zumeta 1998; Voje et al. 2009).

To our knowledge, no previous grasshopper surveys have specifically targeted Mt. Manengouba. This makes it difficult to determine whether the absence of earlier records reflects true rarity or insufficient sampling effort. However, all *O. ruandensis* specimens were collected during the rainy season, suggesting that the species may exhibit seasonal activity patterns that reduce its detectability during drier periods. Additionally, the present study employed sweep-net sampling, a standard yet effective method for collecting grasshoppers in dense herbaceous vegetation, which may have increased the likelihood of detecting this species. These observations emphasize the importance of conducting targeted surveys at specific times of year using appropriate sampling techniques to improve biodiversity assessments in Afrotropical montane ecosystems.

Until now, descriptions of the two species were based exclusively on external morphological characteristics (Rehn 1942; Dirsh 1965; Mariño-Pérez and Song 2023). This study provides additional documentation and illustrations of male genital structures, thereby updating the diagnostic criteria for these two species. The male genitalia of *O. ruandensis* and *O. uvarovi* differ notably in several diagnostic characters. *Occidentosphena ruandensis* is characterized by lophi with a bilobed apex, an ovoid apodemal plate in lateral view, well-developed valves of the cingulum visible in ventral view, a dorsal cleft of the cingulum covered by the aedeagal valves, a narrow ventral cleft, a sheath with a nearly straight apex, and a ventral process of the cingulum broadly covering the endophallic apodemes in ventral view. In contrast, *O. uvarovi* possesses lophi with an acute apex, a rounded apodemal plate in lateral view, valves of the cingulum not visible in ventral view, a large dorsal cleft of the cingulum, a fairly broad V-shaped ventral cleft, a sheath with a rounded apex, and a ventral process of the cingulum entirely covering the endophallic apodemes in ventral view. By incorporating detailed descriptions and illustrations of male genitalia, our study follows recent taxonomic approaches in Orthoptera that emphasize the importance of genital morphology for species delimitation and phylogenetic inference (Yetchom Fondjo et al. 2024, 2025b). This contributes to refining diagnostic criteria and aligns with broader efforts to improve taxonomic resolution in poorly studied Afrotropical insect groups.

Conclusion

The discovery of *O. ruandensis* in Cameroon indicates that its geographic range is wider than what was previously recognized. This includes the Eastern Afromontane region and Cameroon's Volcanic Line. This finding suggests that the species may have a wider, albeit fragmented, distribution across central and eastern Africa. Further surveys are needed to elucidate their biogeographical history. The re-descriptions of *O. uvarovi* and *O. ruandensis* based on newly collected material from Mt. Bamboutos and Mt. Manengouba provide updated diagnostic characters that distinguish them from related species. Due to the species' limited historical documentation, this contribution is important for future systematic work on the genus. Overall, these results emphasize the importance of ongoing orthopteran surveys in the Cameroon Highlands, which, despite their recognized role as centers of endemism, remain insufficiently sampled. Further, integrative studies combining extensive field sampling, morphological and molecular data are likely to reveal additional diversity within *Occidentosphena* and clarify its evolutionary history across African montane systems.

Acknowledgements

We acknowledge the Cameroonian Ministry of Higher Education for providing funds through the research support program. We also thank the conservator of the Mt. Manengouba for the facilitation provided during fieldwork activities. We express our gratitude to our field team members for their help and assistance in the field and to all the local guides of our different study sites for their collaboration and assistance during field activities. Finally, we want to thank the editor and two anonymous reviewers for valuable comments on a previous version of this manuscript.

References

Chopard L (1945) Orthopteroides recueillis dans les montagnes du Cameroun par la Mission Lepesme, Paulian, Villers. Revue Française d'Entomologie 11: 156–178.

Cigliano MM, Braun H, Eades DC, Otte D (2026) *Occidentosphena* Kevan, 1956. Orthoptera Species File. http://orthoptera.speciesfile.org/otus/827786/overview [accessed on 22/03/2026]

Couvreur TLP, Dauby G, Blach-Overgaard A, Deblauwe V, Dessein S, Droissart V, Hardy OJ, Harris DJ, Janssens SB, Ley AC, Mackinder BA, Sonké B, Sosef MSM, Stévart T, Svenning J-C, Wieringa JJ, Faye A, Missoup AD, Tolley KA, Nicolas V, Ntie S, Fluteau F, Robin C, Guillocheau F, Barboni D, Sepulchre P (2021) Tectonics, climate and the diversification of tropical African flora and fauna. Biological Reviews 96: 16–51. https://doi.org/10.1111/brv.12644

Dirsh VM (1965) The African Genera of Acridoidea. Cambridge University Press, London 578 pp.

Dirsh VM (1970) Acridoidea of the Congo (Orthoptera). Annales du Musée Royal de l'Afrique Centrale (série Sciences zoologiques), Tervuren 182: [6] + 605 pp.

Gonwouo LN, LeBreton M, Wild C, Chirio L, Ngassam P, Tchamba MN (2006) Geographic and ecological distribution of the endemic montane chameleons along the Cameroon mountain range. Salamandra 42: 213–230.

Hemp C, Hemp A (2003) *Saltatoria coenoses* of high-altitude grasslands on Mt. Kilimanjaro, Tanzania (Orthoptera: Saltatoria). Ecotropica 9: 71–97.

Hemp C, Hemp A, Wägele JW (2009) Description of a new species of *Parasphena* Bolivar, 1884 (Orthoptera: Pyrgomorphidae) from Northwestern Tanzania and new data on the biogeography, coenology, habitat and morphology of the genus. Journal of Orthoptera Research 18(1): 113–119. https://doi.org/10.1665/034.018.0114

Johnston HB (1968) Annotated Catalogue of African Grasshoppers (Vol. Suppl.). The Cambridge University Press, Cambridge, 445 pp.

Kameni NMM, Gonwouo NL, TapondjouNWP, Tchassem AM, Doherty-Bone T, Allen E, Fomena F (2022) Status and habitat preferences of montane endemic skinks, genera *Lacertaspis*, *Leptosiaphos*, and *Trachylepis*, in the central Cameroon Volcanic Line. Herpetology Notes 15: 271–281.

Kengni L, Tekoudjou H, Pamo Tedonkeng E, Tankou C, Mubeteneh LY, Probst JL (2009) Rainfall variability along the Southern Flank of the Bamboutos Mountain (West Cameroon). Journal of the Cameroon academy of sciences 8(1): 45–52.

Kevan DKM, Akbar SS, Chang YC (1969) The concealed copulatory structures of Pyrgomorphidae (Orthoptera: Acridoidea). Part I. General introduction. Eos 44: 165–266.

Kevan DKM, Akbar SS, Chang YC (1974) The concealed copulatory structures of the Pygromorphidae (Orthoptera: Acridoidea). Part V. Tribes Schulthessiini, Taphronotini, Dictyophorini, Tagastini, Pseudomorphacridini, Atractomorphini, Sphenariini and Omurini. Eos, Revista española de Entomología 48: 203–294.

Kevan DKME (1956) Flightless African genera of pyrgomorphine grasshoppers allied, or superficially similar, to *Parasphena* I. Bolivar, 1884, and *Pyrgomorphella* I. Bolivar, 1904, with description of certain new forms. Publicações Culturais da Companhia de Diamantes de Angola 29: 109–133.

Launois M (1979) Manuel pratique d'identification des principaux Acridiens du Sahel. Paris, GERDAT, Ministère de la Coopération. Revue d'Écologie 33(4): 654–655.

Lindenmayer DB, Fischer J (2006) Habitat Fragmentation and Landscape Change: An Ecological and Conservation Synthesis. Island Press, Washington, DC, USA. https://doi.org/10.2307/jj.41379815

Mariño-Pérez R, Song H (2023) Pyrgomorphidae Genera of the World: Key to Genera. Museum of Zoology, University of Michigan 212: 1–85. https://doi.org/10.7302/22418

Martinelli AB, Waichert C, Barbosa DN, Fagundes V, Azevedo C (2017) The use of Proteinase K to access genitalia morphology, vouchering, and DNA extraction in minute wasps. Anais da Academia Brasileira de Ciências 89: 1629–1633. https://doi.org/10.1590/0001-3765201720160825

Mestre J, Chiffaud J (2023) Les acridiens d'Afrique occidentale et nord-centrale. [4] + 770 p. [ISBN: 978–2-9523632-2-8 Édition numérique PDF]

Myers N, Mittermeier RA, Mittermeier CG, Da Fonseca BGA, Kent J (2000) Biodiversity hotspots for conservation priorities. Nature 403: 853–858. https://doi.org/10.1038/35002501

Rehn JAG (1914) Orthoptera I: Mantidae, Phasmidae, Acrididae, Tettigoniidae und Gryllidae aus dem Zentral-Afrikanischen Gebiet, Uganda und dem Ituri-Becken des Kongo. Wissenschaftliche Ergebnisse der deutschen Zentralafrika Expedition, 1907–1908 5: 1–223. http://www.biodiversitylibrary.org/page/966177#page/7/mode/1up

Rehn JAG (1942) Notes on species of the locust genus *Parasphena*, with description of three new species (Orthoptera, Acrididae, Pyrgomorphidae). Proceeding Academy of Natural Sciences of Philadelphia 94: 287–306.

Ribera I, Blasco-Zumeta J (1998) Biogeographical links between steppe insects in the Monegros region (Aragon, NE Spain), the eastern Mediterranean, and central Asia. Journal of Biogeography 25: 969–986. https://doi.org/10.1046/j.1365-2699.1998.00226.x

Rowell CHF (2013) The grasshoppers (Caelifera) of Costa Rica and Panama. In The Orthopterists' Society Publications on Orthopteran Diversity. Illinois Natural History Survey, Champaign, USA, 611 pp.

Saunders DA, Hobbs RJ, Margules CR (1991) Biological consequences of ecosystem fragmentation – A review. Conservation Biology 5: 18–32. https://doi.org/10.1111/j.1523-1739.1991.tb00384.x

Suchel JB (1988) Les régions climatiques du Cameroun: Les climats du Cameroun. Thèse de Doctorat d'Etat, Université de Saint-Etienne, France, 1188 pp.

Tchassem FAM, Doherty-Bone TM, Kameni NMM, Tapondjou NWP, Tamesse JL, Gonwouo NL (2021) What is driving declines of montane endemic amphibians? New insights from Mount Bamboutos, Cameroon. Oryx 55(1): 23–33. https://doi.org/10.1017/s0030605318001448

Tchibozo S, Lecoq M (2017) Edible Orthoptera from Africa: Preservation and promotion of traditional knowledge. Metaleptea 37(2): 24–29.

Voje KL, Hemp C, Flagstad Ø, Sætre GP, Stenseth NC (2009) Climatic change as an engine for speciation in flightless Orthoptera species inhabiting African mountains. Molecular Ecology 18: 93–108. https://doi.org/10.1111/j.1365-294X.2008.04002.x

Yetchom Fondjo JA, Husemann M, Hawlitschek O (2025a) African jungles: A whole world of undiscovered grasshopper diversity. In: Husemann M, Hawlitschek O (Eds) Grasshoppers, Locusts, and Crickets of the World. Princeton University Press, 318 pp. https://doi.org/10.1515/9780691281063

Yetchom Fondjo JA, Wandji AC, Zahiri R, Hawlitschek O, Hemp C (2025b) Integrative Taxonomy Revealed Cryptic Diversity in the West African Grasshopper Genus *Serpusia* Karsch, 1891 (Orthoptera: Catantopinae). Insect 16: e1020. https://doi.org/10.3390/insects16101020

Yetchom Fondjo JA, Husemann M, Nzoko-Fiemapong AR (2024) Integrative taxonomic revision of the grasshopper genera *Parapetasia* Bolívar, 1884, and *Loveridgacris* Rehn, 1954 (Orthoptera, Pyrgomorphidae), with description of a new species of *Loveridgacris*. Deutsche Entomologische Zeitschrift 71(2): 265–287. https://doi.org/10.3897/dez.71.125877

Yetchom Fondjo JA, Kekeunou S, Kenne M, Missoup AD, Sheng-Guan X (2020) Diversity, abundance, and distribution of grasshopper species (Orthoptera: Acrididea) in three different types of vegetation with different levels of anthropogenic disturbances in the littoral region of Cameroon. Journal of Insect Biodiversity 14: 16–33.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

Ethical approval was not required for this study. The specimens were collected in accordance with local regulations (Permit n°2574 and n°000042).

Artificial Intelligence (AI) use

The authors accept full responsibility for the content of the manuscript, including the disclosure of any use of AI.
Regarding the use of AI in the preparation of this manuscript, the authors declare the following: DeepL Write for: Language, style and writing.
The authors used DeepL Write to improve the linguistic quality of the manuscript, focusing on grammar, clarity and readability. All outputs were then reviewed and validated by the authors.

Funding

This work was supported by the Cameroonian Ministry of Higher Education through its research support program.

Author contributions

All authors conceived the ideas and designed the methodology. ACW, MMN, ALDN and CWK collected the data. JAYF and MH dissected the genitalia and produced the photos in the laboratory. ACW, JAYF, MH and SK identified the species. ACW and JAYF led the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

Author ORCIDs

A.C. Wandji https://orcid.org/0000-0002-4394-9502
J.A. Yetchom Fondjo https://orcid.org/0000-0003-2192-6366
M. Husemann https://orcid.org/0000-0001-5536-6681
M. Mbadjoun Nziké https://orcid.org/0000-0001-5327-1638
A.L. Djomnang Nkwala https://orcid.org/0000-0001-7887-9535
C.W. Kemtchouan https://orcid.org/0009-0002-8688-2480
S. Kekeunou https://orcid.org/0000-0002-9058-100X

Data availability

This study is based on original specimen data collected in Cameroon. All data supporting the findings are included in the manuscript.