



## Discovery of *Antireicheia* in Cameroon with description of four new species and discussion on phylogeny and distribution of endogean Reicheiina (Coleoptera: Carabidae: Scaritinae: Clivinini)

VASILY V. GREBENNIKOV<sup>1,4</sup>, PETR BULIRSCH<sup>2</sup> & PAOLO MAGRINI<sup>3</sup>

<sup>1</sup>Entomology Research Laboratory, Canadian Food Inspection Agency, Canadian National Collection of Insects, K.W. Neatby Bldg., 960 Carling Avenue, Ottawa, Ontario K1A 0C6, Canada. E-mail: vasily.grebennikov@inspection.gc.ca

<sup>2</sup>Milánská 461, CZ-109 00 Praha 111, Czech Republic. E-mail: p.bulirsch@seznam.cz

<sup>3</sup>via Gianfilippo Braccini 7, I-50141 Firenze, Italy. E-mail: magrinip@MAGRINIPAULO.191.it

<sup>4</sup>Corresponding author

### Abstract

The endogean carabid genus *Antireicheia* Basilewsky, 1951, previously known from the eastern and southern Africa and Madagascar is, for the first time, reported west of the Congo basin. Four new species are described and illustrated: *A. demirei* **sp. nov.** (Cameroon: Mt. Oku), *A. hintelmanni* **sp. nov.** (Cameroon: Mt. Oku), *A. deuvei* **sp. nov.** (Cameroon: Mt. Bamboutos) and *A. camerounensis* **sp. nov.** (Cameroon: Bafut, Nguemba forest). A key to Cameroonian *Antireicheia* species is provided. The composition of the subtribe Reicheiina, its monophyly, world distribution, as well as zoogeographical implications of its discovery in Western Africa, are discussed.

**Key words:** Coleoptera, Carabidae, Reicheiina, *Antireicheia*, taxonomy, new species, key, Cameroon, Mt. Oku, Mt. Bamboutos, Nguemba forest

### Introduction

The Old World carabid subtribe Reicheiina consists of 16 genera, 143 species and 25 subspecies of apterous and endogean beetles with the body length averaging about two millimetres (Basilewsky 1980; Magrini & Bulirsch 2005). These anophthalmic beetles are predominantly known from the type series and are collected by sifting forest leaf litter or hand picked from under large stones deeply sunk into the ground. The majority of the genera (13 among 16) and species are known from the Mediterranean Region with most of the remaining taxa inhabiting the Afrotropical Region (Fig. 30). Recently three new Reicheiina species have been described from Laos, Vietnam and Japan, respectively. Each of them is known only from the holotype, and attributed to one new, and, reluctantly, to one Mediterranean and one Afrotropical genus (Balkenohl 2005). The discovery of Reicheiina in Pacific Asia indicates a significant distributional disjunction of closely related wingless, blind and presumably poorly dispersing endogean beetles. Alternatively, it could suggest a non-monophyletic nature of the subtribe composed of unrelated and convergently similar soil dwellers.

No Reicheiina species were previously described west of the Congo basin, although Basilewsky (1980: 294, fig. 9) reported undescribed *Antireicheia* in Cameroon collected by Philippe Bruneau de Miré and preserved in the Muséum national d'histoire naturelle, Paris, France. Bruneau de Miré, a prominent French entomologist, who from 1964 to 1974 worked in the Centre de recherches agronomiques de Nkolbisson in Yaounde, actively collected endogean beetles and later described two most remarkable Cameroonian Anillini: *Carayonites* Bruneau de Miré, 1986 and *Bafutyphlus* Bruneau de Miré, 1986, members of another group of poorly understood endogean carabids. Recently one of us (VVG) collected a single female of an *Antireicheia*

species (Figs. 23–29) in Cameroon. The find triggered a re-examination of Bruneau de Miré's material and resulted in the completion of the present project.

No attempt has been made to study the subtribe Reicheiina from a cladistic perspective. Its current placement in the tribe Clivinini and generic composition are more a result of gradually evolving historical beliefs of earlier authors, most notably of such influential people as René Jeannel (1957) and Pierre Basilewsky (1980), rather than a reflection on its hypothesised monophyly. The discovery of Reicheiina in Laos, Vietnam and Japan (Balkenohl 2005) revealed a large gap in their known distribution and, implicitly, challenged the monophyly of the subtribe. The presently reported discovery of this subtribe in Cameroon further demonstrates the existence of wide gaps in the Reicheiina distribution. This paper is aimed, therefore, at introducing new Cameroonian species to the scientific community and highlighting the puzzling distribution of Reicheiina in conjunction with the lack of the modern phylogenetic hypothesis for the subtribe.

## Material and methods

Most, or potentially all, of Bruneau de Miré's specimens of the new Cameroonian *Antireicheia* species were collected using the flotation method. The single 2006 *Antireicheia* female from Mt. Oku was collected by sifting forest leaf litter with the subsequent extraction of organisms using Winkler's funnels. Body length is given to an accuracy of 0.05 mm; other measurements, ratios and means are given to two decimal places. The length of the median lobe of aedeagi and antennae was measured only for holotypes; total body length, head, pronotum and elytra were measured for all specimens. A dissecting microscope was used at magnifications up to  $\times 56$ . Aedeagi and stylomeres were slide-mounted in Euparal. All photographs were prepared by PM with a Nikon D1 digital camera mounted on a Nikon Labophot II binocular microscope equipped with lenses containing diaphragms. Label data for all specimens are cited verbatim. Environmental scanning electron microscopy was performed without coating specimens with metal. Other methods and terms employed in this paper were previously explained (Bulirsch & Magrini 2006). The following abbreviations have been used:

MNHN	Muséum national d'histoire naturelle, Paris, France
PBC	collection of P. Bulirsch, Prague, Czech Republic
PMC	collection of Paolo Magrini, Firenze, Italy
HT	Holotype
PT	Paratype(s)
BSP	basal (prescutellar) setiferous puncture(s)
DSP	dorsal setiferous puncture(s)
/, //	by locality labels: end of line (/) and end of individual label (//)
[]	by locality labels: insertion of our data interpretation; not on the original label

## Genus *Antireicheia* Basilewsky, 1951

**Type species:** *Reicheia promontorii* Péringuey, 1896, original designation.

= *Afroreicheia* Jeannel, 1957 (type species *Antireicheia jeanneli* Basilewsky, 1951, original designation; genus synonymised by Bulirsch & Magrini, 2007: 17).

**Description.** Small (body length 1.5–4.5 mm), rusty brown, endogean, flightless Clivinini. Head with oblique impressions on clypeus; Y-shaped dorsal medial keel on frons from short and blunt to missing; eyes completely absent (Figs. 23, right arrow –25), without externally visible facets, ocular area of each gena with trace of differently pigmented field representing eye remnants; genal hind angles from obtuse (Fig. 1) to almost rectangular (Fig. 24); vertex usually more or less reticulate (Figs. 24, 25); antennae with antennomeres 6–10 about as wide as long, never distinctly elongated (Fig. 27); apical maxillary palpomeres securiform (Fig.

25, arrow). Pronotum with sides slightly or distinctly rounded in dorsal view (Fig. 27); variously narrowed anteriorly; posterior angles broadly rounded; reflexed lateral margin entire (Fig. 28, upper arrow), extending from mostly rounded and obtuse anterior angles to base as prebasal groove; prebasal groove in some species fine and poorly visible; posterior median part of pronotal base mostly small, faintly protruding (Fig. 27, right arrow), not separated from disk by distinct furrow; with 2 pairs of lateral setiferous punctures and no discal/sublateral setae; median line distinctly impressed posteriorly; anterior transverse impression very fine or absent; posterior part of episterna visible from above (Fig. 27, left arrow). Elytra with anterior angles bearing 0 to 5 humeral teeth (Fig. 28, lower arrow), rarely with serration in anterior part (Fig. 29, upper arrow) extending sometimes to elytral apex; stria of elytral punctures gradually disappearing apically (Fig. 27); elytra with 0 to 4 relatively small dorsal setiferous punctures on third interval, other intervals without punctures. Last visible ventrite in males slightly reticulate in apical half; in females moderately reticulate in apical two-thirds (Fig. 29, lower arrow). Aedeagus as in Figs. 2, 3, 7, 8, 12, 13, 18, 19; parameres as in Figs. 4, 9, 14, 20, bi- or trisetose; stylomeres as in Figs. 5, 10, 16, 22.

Along with the generic *Antireicheia* features, all four new Cameroonian species described below have the following features in common: head with an indistinctly emarginated anterior clypeal margin (Fig. 23, left arrow), with frontal facial furrows and oblique impressions deep and broad, latter with very short and blunt indistinct posterior keel, with neck broad and slightly diverging posteriad; pronotum laterally moderately vaulted, with indistinct anterior and moderately impressed median impression, with lateral margin finely impressed up to base, with small, slightly protruded flange (basal part of pronotum); elytra laterally moderately vaulted, not distinctly flattened, elytral base with distinct BSP and without basal tubercle, with elytral sutures deeply depressed basally; fore tibia and surface of last abdominal ventrite in both sexes without specific differences.

**Diagnosis.** The genus *Antireicheia* can be distinguished from all of the Palearctic Reicheiina mainly by the presence of 0 to 4 DSP on the third elytral interval. Unlike *Antireicheia*, Palearctic species have several setae minimally on intervals 3, 5, and occasionally, on intervals 2 to 7. Species of the genus *Antireicheia* differ from those belonging to the genera *Reicheadella* Reitter, 1913, *Chaetomargoreicheia* Magrini et Bulirsch, 2005, *Laoreicheia* Balkenohl, 2005 and *Dimorphoreicheia* Magrini, Fancello et Leo, 2002 by lacking discal and sublateral punctures on the pronotum. The distinct pronotal prebasal groove and 0–4 dorsal setiferous punctures in interval 3 only differentiate *Antireicheia* species from those of the genus *Reicheia* recorded from Northern Africa (Algeria, Tunis), although both *Reicheia* and *Antireicheia* can hardly be differentiated from one another. *Antireicheia* differs from the monotypic genus *Kenyoreicheia* recently described from the Kenyan Aberdare Mts. by the shape of the stylomeres and pronotum (see Bulirsch & Magrini, 2007).

**Composition and geographical distribution.** Including the four new species described below, the genus *Antireicheia* consists of 47 species with seven subspecies. It is known from Madagascar (16 species with two subspecies), South Africa (Western and Eastern Cape provinces; 10 species), East Africa (Uluguru and Usambara mountains in Tanzania and the lake Kivu region on the Rwanda/DRC border; 17 species with five subspecies) and West Africa (Cameroon highlands: four new species). Péringuey (1896) described the first *Antireicheia* species from the Cape Town area; other species descriptions followed more than half century later (Basilewsky 1951a,b, 1953, 1960, 1962, 1973, 1976, 1980; Jeannel 1957, 1958; Bulirsch *et al.* 2005; Bulirsch & Magrini 2006, 2007). An aberrant *Antireicheia margolata* Balkenohl, 2005 has been described from Vietnam, although, as stated by the author, this species is most likely not congeneric with the rest of the genus. Basilewsky (1980: 294) stated that no Reicheiina were known from the geologically more recent highlands of the Ruwenzori Range, Mt. Elgon, Mt. Kenya and Mt. Kilimanjaro, although he did not exclude their subsequent discoveries in Ethiopian highlands (i.e. Bale Mts.).

**Monophyly and phylogenetic relationships.** Monophyly of the genus *Antireicheia* has never been demonstrated and the genus is defined by a combination of morphological similarities and by the Afrotropical origin of the included species. Synonymisation of *Afroreicheia* with *Antireicheia* was an attempt to make the resulting taxon larger monophyletic (Bulirsch & Magrini 2007), although its monophyly is still far from being clearly demonstrated.

Three former "*Afroreicheia*" species from Madagascar and two *Antireicheia* from East Africa pose taxonomic difficulties. Madagascan *Antireicheia elongata* Jeannel, 1958 is morphologically much different from all African Reicheiina, and probably not congeneric with other Afrotropical Reicheiina. *Antireicheia bonsae* (Basilewsky, 1973) from Madagascar, *A. bergeri* Basilewsky, 1976 and *A. grebennikovi* Bulirsch et Magrini, 2007, both from East Africa, differ from other *Antireicheia* species by having (A.) flange larger and more distinctly developed (although still less distinct than in *Trilophidius* Jeannel, 1957); (B.) flange separated from the rest of pronotum by a distinctly developed furrow and by (C.) elytral striae longer and effaced closer to the elytral apex. These three features make these three *Antireicheia* species resembling members of the genus *Trilophidius*, although still clearly distinguishable from the latter by the absence of functional eyes and by the reflexed margin of pronotum extending well beyond posterior setiferous puncture. Moreover, we did not study the type specimen of *A. franzi* Basilewsky, 1973, the only Afrotropical Reicheiina species not seen by us, and, therefore, its taxonomic status is unclear.

If monophyletic, the genus *Antireicheia* is particularly close to, if at all different from, the genus *Reicheia*. A newly described and morphologically highly modified monotypic genus *Kenyoreicheia* Magrini & Bulirsch, 2007 from the Aberdare Mountains in Kenya is the only non-*Antireicheia* Afrotropical Reicheiina, which implicitly suggests paraphyly of the former genus in respect to *Kenyoreicheia*. Sister-group relationships or any other aspects of *Antireicheia* phylogeny have never been addressed.

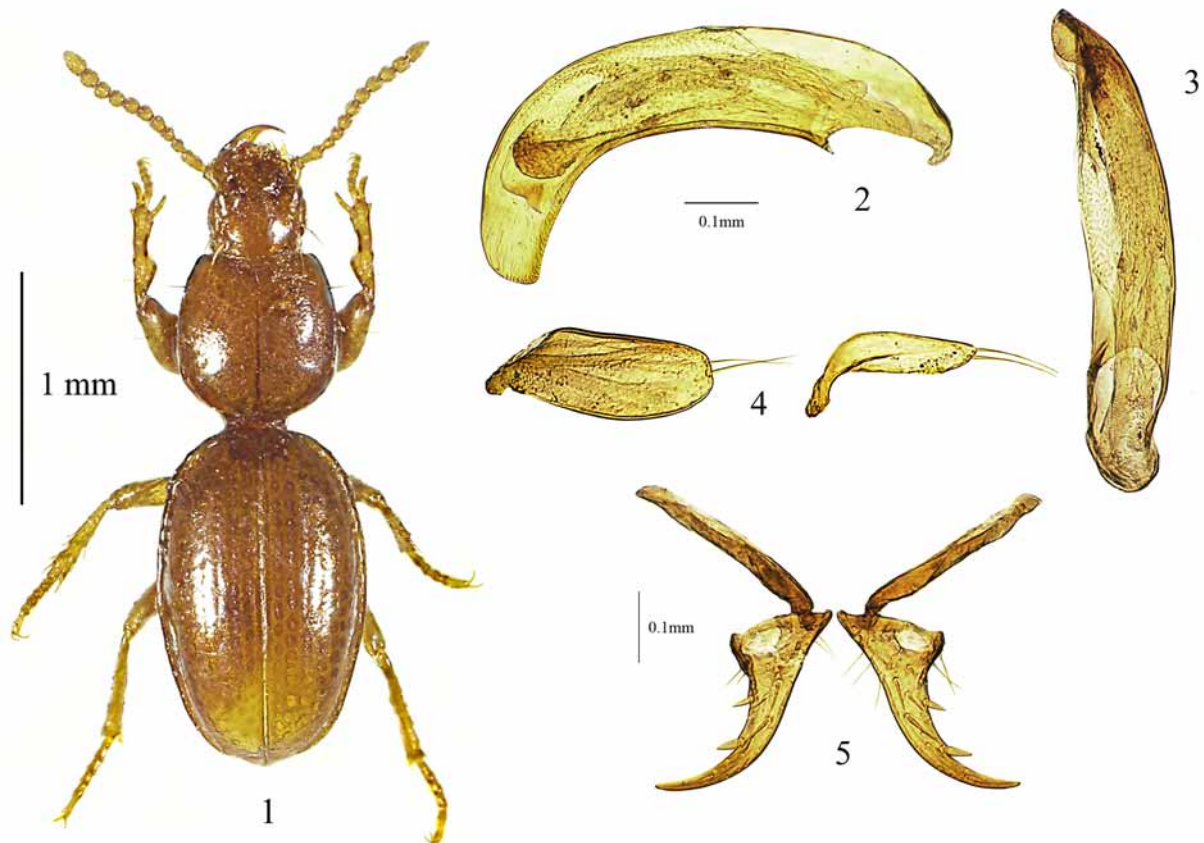
**Bionomics.** No biological data other than collecting records are available for *Antireicheia* or, in fact, for any Reicheiina species. Adult beetles are obtained by floating soil sifted from the leaf litter or found under larger boulders sitting at least five centimetres deep in the soil (Basilewsky, 1980). *Antireicheia* species are predominantly found in forested montane areas, although all specimens of the presumably related *K. aberdarensis* Magrini & Bulirsch, 2007 were collected in the alpine zone of the Aberdare Range in Kenya. From these observations it seems plausible to assume that *Antireicheia* specimens inhabit soil crevices, although their more subtle biological preferences are unknown. Immature stages of *Antireicheia*, as well as any other Reicheiina, have never been described.

#### *Antireicheia demirei* sp. nov.

(Figs. 1–5)

**Type material.** Holotype (MNHN) male labelled "OKU, 2900 m/ Ft de Podocarpus/ 5–9–XI–[19]75// lavages de/ terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre–Novembre 1975" Paratypes (MNHN, PBC, PMC): 5 males, 5 females with the same data as HT.

**Description.** Body rusty yellow-brown, antennae, mouthparts and legs slightly paler (Fig. 1); length 2.70–3.00 mm (HT 2.75 mm, mean 2.85 mm, n=11). **Head** with ocular part of genae not protruded, eye remnant discernable as small, whitish unfacetted field in anterolateral margin of slightly vaulted genae; genal posterior angles broadly rounded; supraantennal plates separated from genae by moderately deep and broad furrow; vertex without reticulation; antennomeres 6–10 slightly longer than broad; antennal length 0.83 mm (HT). **Pronotum** with sides moderately rounded, slightly attenuated anteriorly; anterior angles blunt, not protruded anterad; ratio of pronotal length to width 1.02–1.08 (HT 1.05, mean 1.04); ratio of pronotal width to head width 1.53–1.61 (HT 1.54, mean 1.56). **Elytra** ovate, strongly broadened, maximum width distinctly before middle; base strongly sloping; humeri indistinct, broadly rounded; lateral channel moderately broad, not narrowed apicad; reflexed lateral margin with 3–4 long, slightly prominent humeral teeth; striae 1–3(4) slightly depressed, lateral ones consisting of sparse punctures; median striae (especially 1–4) finely and irregularly punctate in basal two third, lateral ones (especially 6–7) very fine; all striae gradually disappearing apicad; latero-apical part smooth; elytral intervals flattened, third interval without DSP; ratio of elytral length to width 1.61–1.69 (HT 1.62, mean 1.64); ratio of elytra length to pronotal length 1.99–2.09 (HT 2.01, mean 2.03); ratio of elytral width to pronotal width 1.25–1.32 (HT 1.31, mean 1.28). **Aedeagus** with median lobe (Figs. 2, 3) 0.64 mm long (HT); parameres as in Fig. 4. **Stylomeres** as in Fig. 5.



**FIGURES 1–5.** *Antireicheia demirei* sp. nov. from Cameroon (Mt. Oku), holotype (1–4) and paratype (5); 1—habitus, dorsal; 2–3—aedeagus: lateral (2) and ventral (3); 4—parameres; 5—stylomeres.

**Differential diagnosis.** *Antireicheia demirei* is the largest among four Cameroonian species with the body length varying between 2.70 and 3.00 mm; none of other Cameroonian *Antireicheia* are known to exceed 2.45 mm.

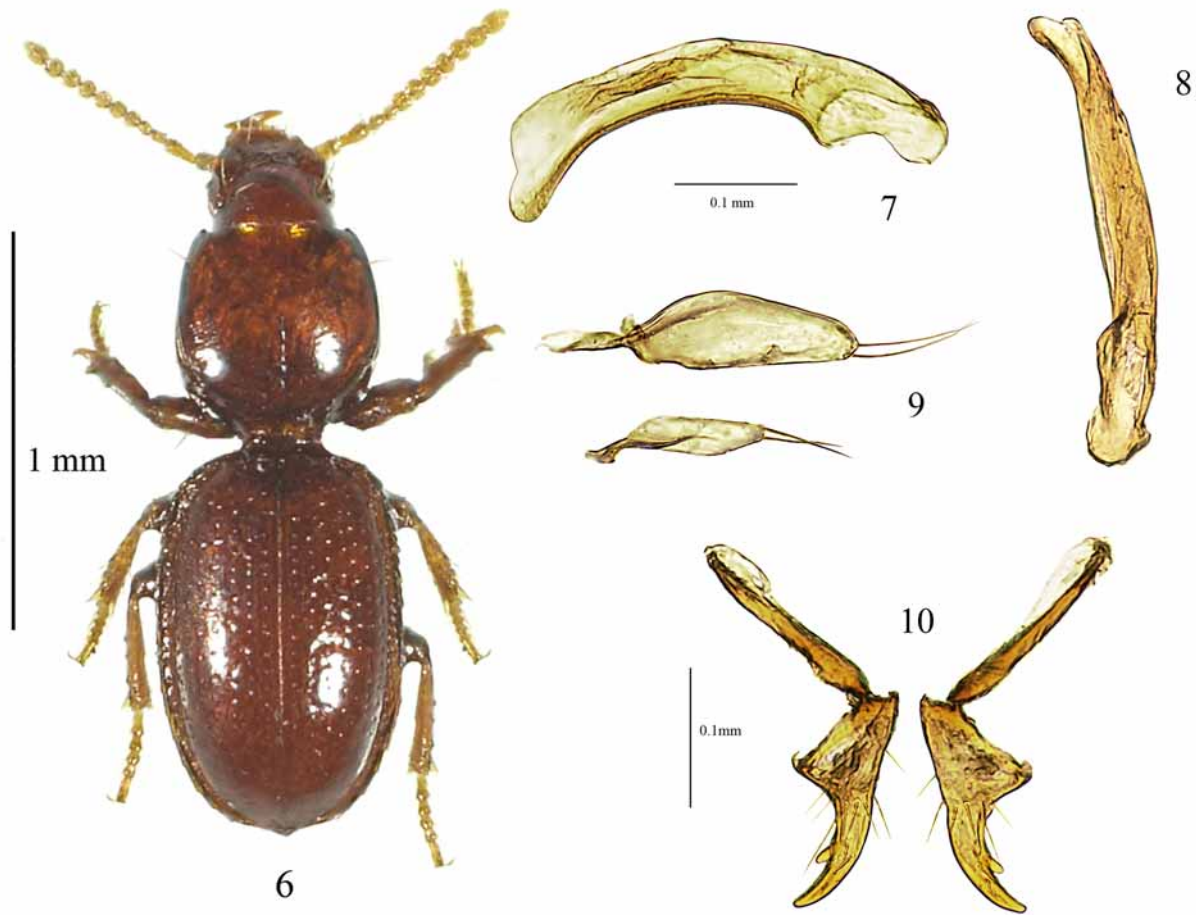
**Etymology.** Patronymic, named in honor of the species collector, Philippe Bruneau de Miré (Paris, France).

***Antireicheia hintelmanni* sp. nov.**

(Figs. 6–10, 23–29)

**Type material.** Holotype (MNHN) male labelled "OKU, 2000 m/ route de Banyo/ 5–9–XI–[19]75// lavages de/ terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris". Paratypes (MNHN, PBC, PMC): 4 males, 3 females with the same data as HT; 1 female (PBC) labelled: "Cameroon: N.-West/ prov., Mt. Oku, N 06°12./ 801'; E 010°31.837'/ 3.V.2006, 2800 m/ V. Grebennikov leg."

**Description.** Body rusty red-brown, antennae, mouthparts and legs slightly paler (Fig. 6); length 1.85–2.00 mm (HT 1.90 mm, mean 1.92 mm, n=8, excluding single much larger 2006 female with body length 2.20 mm). **Head** with ocular part of genae protruded, eye remnant discernable as small, whitish unfacetted field in anterolateral margin of strongly vaulted genae; genal posterior angles shortly rounded; supraantennal plates separated from genae by deep, broad furrow; vertex with fine, regular reticulation; antennomeres 6–10 distinctly wider than long; antennal length 0.59 mm (HT). **Pronotum** with sides moderately rounded, not attenuated anteriorly; anterior angles sharp, distinctly protruding anterad; ratio of pronotal length to width 0.95–1.00 (HT 1.00, mean 0.97; excluding single 2006 female with ratio 1.03); ratio of pronotal width to head width 1.52–1.61 (HT 1.57, mean 1.56). **Elytra** slightly ovate, moderately broadened, maximum width



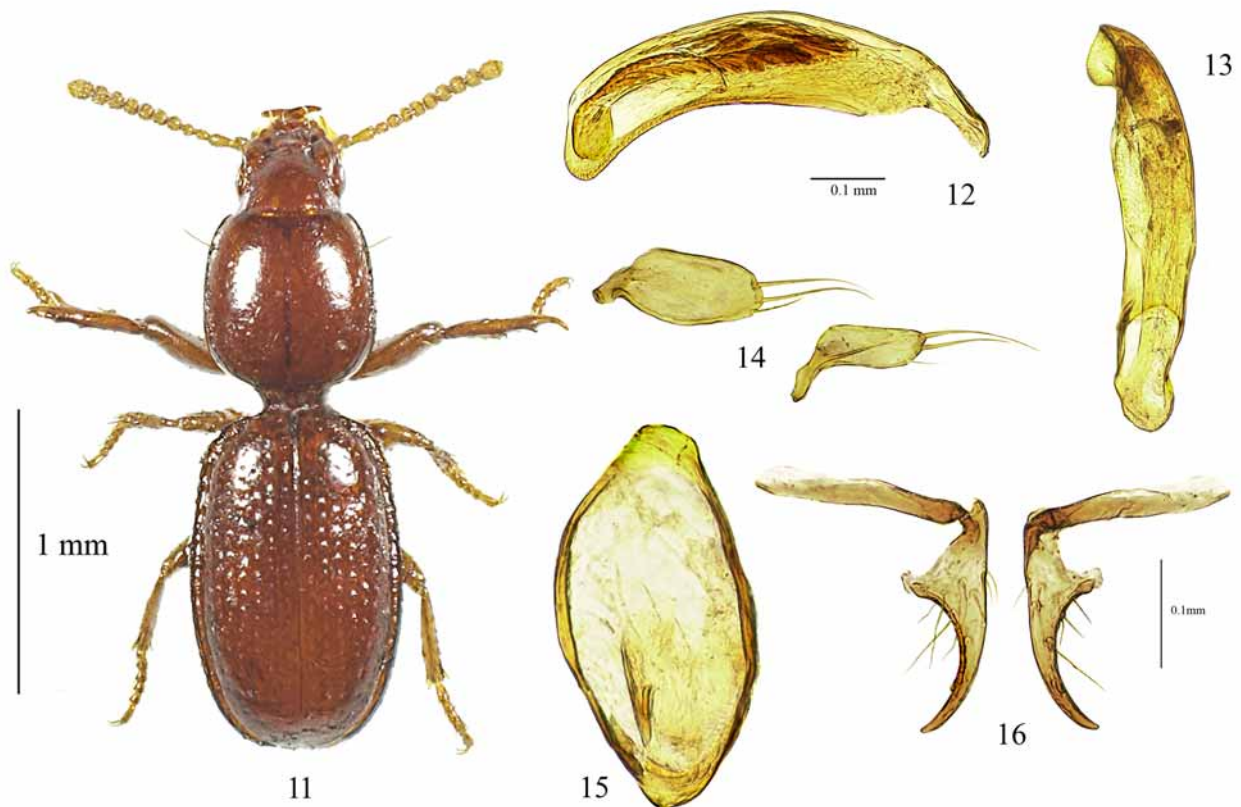
**FIGURES 6–10.** *Antireicheia hintelmanni* sp. nov. from Cameroon (Mt. Oku), holotype (6–9) and paratype (10); 6—habitus, dorsal; 7–8—aedeagus: lateral (7) and ventral (8); 9—parameres; 10—stylomeres.

just before middle; base slightly sloping; humeri moderately rounded; lateral channel very broad, slightly narrowed apicad; reflexed lateral margin with about 20 humero-lateral teeth, first 6–8 humeral teeth shorter and sharper, latero-apical teeth longer and more obtuse; median stria slightly and irregularly impressed in basal two thirds, other striae consisting of rows of sparse punctures; median striae moderately and equally punctured in basal two third; striae 6–7 slightly finer, latero-apical part smooth; elytral intervals flattened, third interval with 3–4 DSP; ratio of elytral length to width 1.53–1.60 (HT 1.54, mean 1.55); ratio of elytra length to pronotal length 1.90–2.05 (HT 1.92, mean 1.98); ratio of elytral width to pronotal width 1.19–1.27 (HT 1.24, mean 1.23). **Aedeagus** with median lobe (Figs. 7, 8) 0.36 mm long (HT); parameres as in Fig. 9. **Stylomeres** as in Fig. 10.

**Variability.** Single female collected in 2006 at the altitude of 2800 m is lighter, larger (2.20 mm versus 1.85–2.00 mm), its pronotum is slightly narrower (ratio length to width 1.03 versus 0.97–1.00) with less protruded anterior angles.

**Differential diagnosis.** *A. hintelmanni* sp. nov. can be distinguished from *A. demirei* sp. nov., the second species from Mt. Oku, mainly by its smaller body (1.85–2.20 mm versus 2.70–3.00 mm); by the more protruding eyes; by the elytral margin with several marginal teeth; by the third elytral interval with (3–)4 DSP and by the different shape of the aedeagus (Figs. 2–3 versus Figs. 7–8).

**Etymology.** Patronymic, in commemoration of the late Robert J. H. Hintelmann (Munich, Germany).



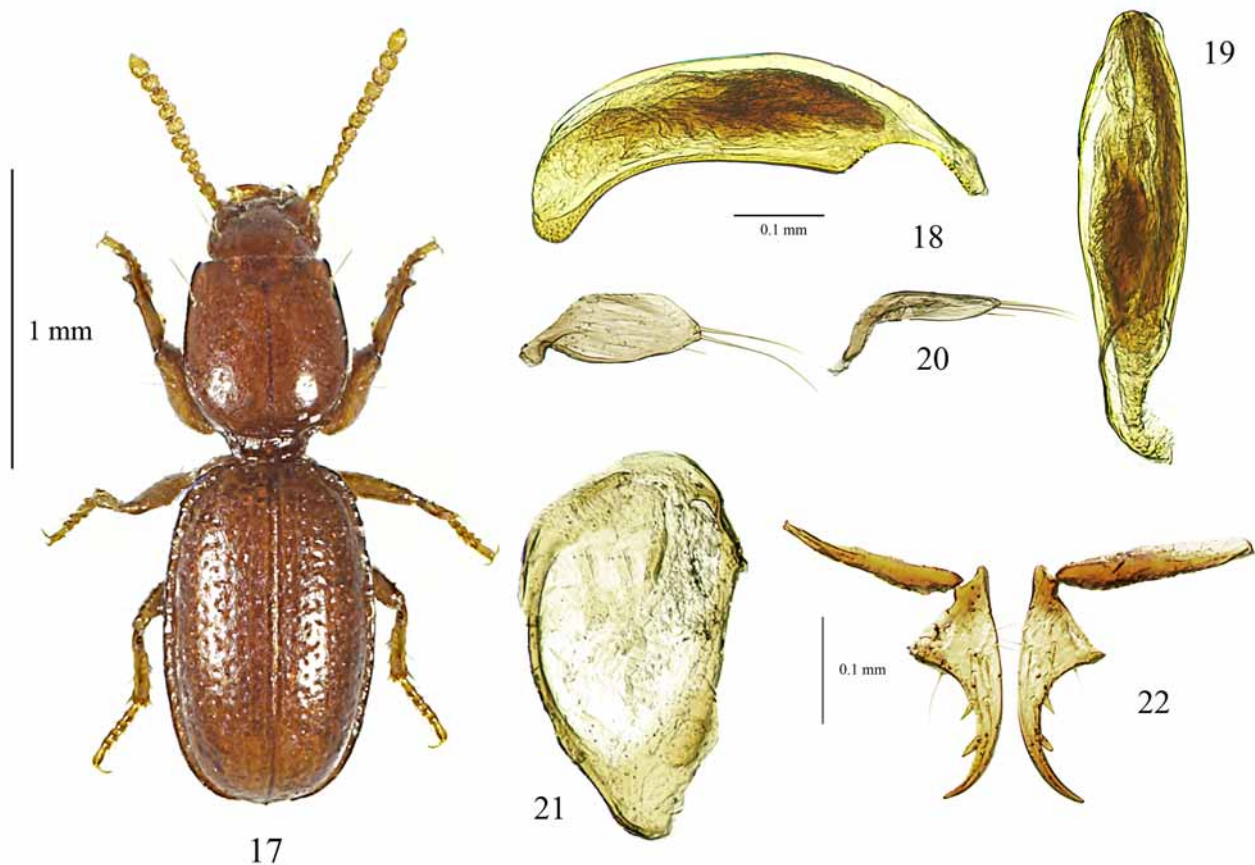
**FIGURES 11–16.** *Antireicheia deuvei* sp. nov. from Cameroon (Mt. Bamboutos), holotype (11–15) and paratype (16); 11—habitus, dorsal; 12–13—aedeagus: lateral (12) and ventral (13); 14—parameres; 15—urite; 16—stylomeres.

***Antireicheia deuvei* sp. nov.**

(Figs. 11–16)

**Type material.** Holotype (MNHN) male labelled "Mt Bamboutos/ 2600 m/ 30.31.X.[19]75// lavages de terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris". Paratypes (MNHN, PBC, PMC): 19 unsexed specimens with the same data as HT; 4 unsexed specimens labelled "Bamboutos/ 2600 m/ 31.X.[19]75// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris".

**Description.** Body light rusty-brown, antennae, mouthparts and legs slightly paler (Fig. 11); length 2.10–2.30 mm (HT 2.15 mm, mean 2.19 mm, n=24). **Head** with ocular part of genae not protruding, eye remnant discernable as very small, whitish unfacetted field in anterolateral margin of moderately vaulted genae; genal posterior angles moderately rounded; supraantennal plates separated from genae by moderately deep and broad furrow; vertex with fine, irregular reticulation; antennomeres 6–10 slightly wider than long; antennal length 0.62 mm (HT). **Pronotum** with sides in anterior part very slightly (HT, some PT) to slightly (other PT) rounded, moderately attenuated anteriorly; anterior angles sharp, slightly protruding anterad; ratio of pronotal length to width 1.02–1.08 (HT 1.06, mean 1.05); ratio of pronotal width to head width 1.38–1.48 (HT 1.45, mean 1.45). **Elytra** almost oval, slightly broadened, maximum width just before middle; base slightly sloping; humeri broadly rounded; lateral channel broad, not narrowed apicad; reflexed lateral margin with 2(–3) humeral teeth; all striae consisting of rows of sparse, fine punctures; in apical third punctures finer; latero-apical part almost smooth; elytral intervals flattened, third interval without DSP; ratio of elytral length to width 1.66–1.79 (HT 1.71, mean 1.72); ratio of elytral length to pronotal length 2.03–2.13 (HT 2.08, mean 2.08); ratio of elytral width to pronotal width 1.21–1.32 (HT 1.28, mean 1.27). **Aedeagus** with median lobe (Figs. 12, 13) 0.50 mm (HT); parameres as in Fig. 14; urite as in Fig. 15. **Stylomeres** as in Fig. 16.



**FIGURES 17–22.** *Antireicheia camerounensis* sp. nov. from Cameroon (Bafut, Nguemba forest), holotype (17–21) and paratype (22); 17—habitus, dorsal; 18–19—aedeagus: lateral (18) and ventral (19); 20—parameres; 21—urite; 22—stylomeres.

**Differential diagnosis.** *Antireicheia devei* sp. nov. can be distinguished from *A. demirei* sp. nov. by the smaller body (2.10–2.30 mm versus 2.70–3.00 mm), by the elytra with less rounded humeri and by the distinctly deeper strial punctures; from *A. hintelmanni* sp. nov. by the non-protruding ocular part of the genae, by the elytral lateral margin without several teeth, by no DSP, and from both species by the shape of the aedeagus (Figs. 12–13 versus Figs. 2–3, 7–8). *Antireicheia devei* sp. nov. can be distinguished from *A. camerounensis* sp. nov. using the last couplet in the species key.

**Etymology.** Patronymic, in honor of Thierry Deveu (MNHN, Paris, France).

***Antireicheia camerounensis* sp. nov.**  
(Figs. 17–22)

**Type material.** Holotype (MNHN) male labelled "Ft. de Bafut/ Nguemba/ 17–XI–[19]69// Muséum Paris/ Cameroun/ B. de Miré// Muséum/ Paris". Paratypes (MNHN, PBC, PMC): 1 male and 1 female with the same data as HT; 1 female labelled "Bafut Nguemba/ de la Haute Nguemba)// alt. 2400 m/ 31–X–1975// lavages de terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris"; 1 female labelled "Bafut Nguemba/ de la Haute Nguemba)// alt. 2400 m/ 31–X–1975// lavages de terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris"; 1 female labelled "Ft. de Bafut/ Nguemba/ 16–VIII–[19]65// Muséum Paris/ Cameroun/ B. de Miré// Muséum/ Paris"; 2 females labelled "Bafut Nguemba// alt. 2100 m/ 22–X–3–XI–1975// lavages de terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris"; 1 male labelled "Bafut Nguemba/ de la Haute Nguemba)// lavages de



terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris"; 2 males and 4 females labelled "Bafut Nguemba/ 2000 m/ 24 à 31.X.1975// lavages de terre// Mission Cameroun/ C.N.R.S. RCP 318/ Octobre-Novembre 1975// Muséum/ Paris".

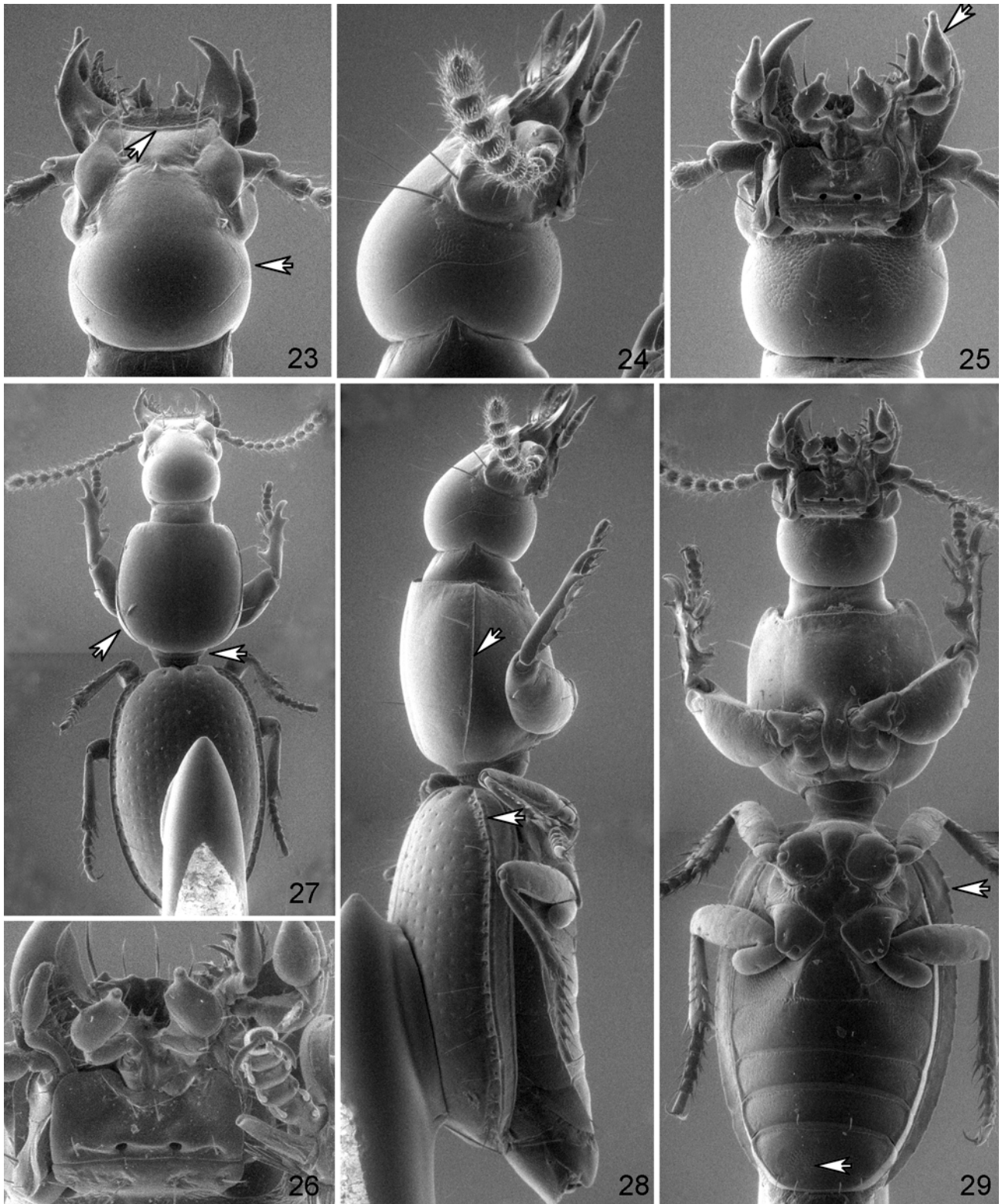
**Description.** Body rusty red-brown, legs, antennae and mouthparts rusty-yellow, fore legs slightly darker (Fig. 17); length 2.30–2.45 mm (HT 2.30 mm, mean 2.35 mm, n=14). **Head** with ocular part of genae not protruding, eye remnant discernable as very small, whitish unfacetted field in anterolateral margin of moderately vaulted genae; genal posterior angles moderately rounded; supraantennal plates separated from genae by moderately deep and narrow furrow; vertex with fine, irregular reticulation; antennomeres 6–10 slightly wider than long; antennal length 0.66 mm (HT). **Pronotum** with sides in anterior part moderately rounded, slightly attenuated anteriorly; anterior angles blunt, not distinctly protruding anterad; ratio of pronotal length to width 1.01–1.06 (HT 1.06, mean 1.04); ratio of pronotal width to head width 1.46–1.56 (HT 1.55, mean 1.51). **Elytra** almost oval, moderately broadened, maximum width just before middle; base slightly sloping; humeri broadly rounded; lateral channel moderately broad, slightly narrowed apicad; reflexed lateral margin with 3(–4) distinct humeral teeth and with fine, just recognizable lateral denticulation especially in basal half; median stria slightly and irregularly impressed in basal two thirds, other striae consisting of rows of sparse punctures; median striae basally with moderately rough punctures, lateral ones finer, apical inclination smooth; inner intervals slightly vaulted basally, third interval without DSP; ratio of elytral length to width 1.64–1.72 (HT 1.68, mean 1.68); ratio of elytral to pronotal length 1.94–2.04 (HT 1.96, mean 2.00); ratio of elytral width to pronotal width 1.20–1.28 (HT 1.23, mean 1.23). **Aedeagus** with median lobe (Figs. 18–19) 0.57 mm long (HT); parameres as in Fig. 20; urite as in Fig. 21. **Stylomeres** as in Fig. 22.

**Differential diagnosis.** *Antireicheia camerounensis* sp. nov. is most similar to *A. devei* sp. nov., from which it can be distinguished by its shape of the pronotum having a more rounded outline in its anterior part; by the symmetrical median lobe of the aedeagus in ventral view with its apex not turned to left (Fig. 19 versus Fig. 13) and by the generally lighter, larger body (2.30–2.45 mm versus 2.10–2.35 mm). *Antireicheia camerounensis* sp. nov. can be distinguished from *A. demirei* sp. nov. by the smaller body (2.30–2.45 mm versus 2.70–3.00 mm), by the less rounded elytral humeri and the distinctly deeper strial punctures; from *A. hintelmanni* sp. nov. by the ocular part of the genae not protruding, by the elytral lateral margin without several teeth, by the lack of DSP, and from both latter species by the different shape of the aedeagus (Figs. 18–19 versus Figs. 2–3, 7–8).

**Etymology.** Specific epithet derives from the French name of Cameroon.

### Key to species of Cameroonian *Antireicheia*

- 1(2) Larger species, body length 2.70–3.00 mm; elytral base in dorsal view strongly sloping (Fig. 1); 0 DSP ..... *A. demirei* sp. nov.
- 2(1) Smaller species, body length 1.85–2.45 mm; elytral base in dorsal view slightly sloping (Figs. 6, 11, 17); 0 to 4 DSP ..... 3
- 3(4) Smaller species, body length 1.85–2.20 mm; (3–)4 DSP; ocular part of genae distinctly protruding laterally (Figs. 6, 23, 25), lateral margin of elytra distinctly serrate (Figs 6, 29, upper arrow) ..... *A. hintelmanni* sp. nov.
- 4(3) Larger species, body length 2.10–2.45 mm; 0 DSP; ocular part of genae not protruding laterally; lateral margin of elytra at most indistinctly serrate ..... 5
- 5(6) Median lobe of aedeagus in ventral view with apex turned to left (Fig. 13); pronotum between anterior angles and anterior setiferous punctures slightly rounded anteriorly; body lighter and smaller (body length 2.10–2.35 mm) ..... *A. devei* sp. nov.
- 6(5) Median lobe of aedeagus in ventral view with almost symmetrical apex (Fig. 19); pronotum between anterior angles and anterior setiferous punctures moderately rounded anteriorly; body darker and larger (body length 2.30–2.45 mm) ..... *A. camerounensis* sp. nov.



FIGURES 23–29. *Antireicheia hintelmanni* sp. n. from Cameroon (Mt. Oku), female, scanning electron microscope images, body length 2.20 mm.; 23–25—head: dorsal (23), lateral (24), ventral (25); 26—mouthparts ventral; 27–29—habitus: dorsal (27), lateral (28) and ventral (29).

## Discussion

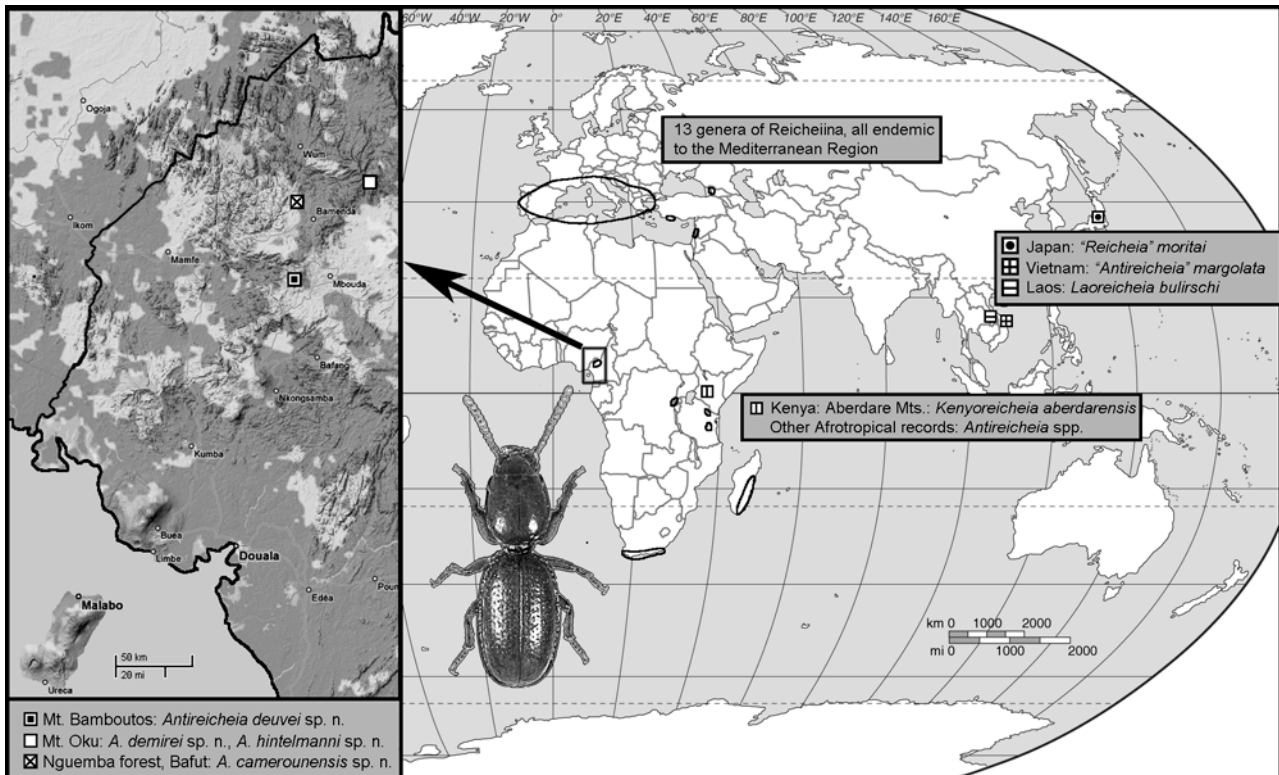
**Diagnosis, monophyly and possible relationships of Reicheiina.** Members of the subtribe Reicheiina are best diagnosed within the tribe Clivinini by the following combination of characters: small, wingless and

depigmented species with fully reduced eyes, with securiform palpi and with pronotum having posterior angles broadly rounded and relatively small flange. The monophyly of the subtribe Reicheiina, however, has never been addressed using phylogenetic methodology. As presently defined, only a historic tradition supports its position as a discrete taxonomic unit for similarly shaped, small endogean Clivinini. The majority of the morphological characters defining Reicheiina (see, for example, Basilewsky, 1980) are “reduction” features correlating with the endogean way of life and commonly found throughout different and non-related groups of endogean Coleoptera. These features include the relatively small body size, aptery, body de-pigmentation, and eye reduction to none, one, or just a few ommatidia.

Besides Reicheiina, other apparently unrelated representatives of the subfamily Scaritinae demonstrate reduction of eye size, size of wings and intensity of body pigmentation in a presumed correlation with their lifestyle. Other blind Clivinini belong either to the subtribe Clivinina (like the recently described genus *Trogloclivina* Deuve, 2003 from Papua New Guinea) or to monotypic subtribe Italodytina Jeannel, 1957 from caves in south Italy. Some species of Afrotropical *Afrosyleter* Basilewsky, 1959 and *Leleuporella* Basilewsky, 1956 have eyes markedly reduced in size. Several Afrotropical species of the genus *Trilophidius* Jeannel, 1957 have eyes also reduced in size. The same tendency towards eye reduction among Neotropical Clivinina can be seen in the cave-inhabiting *Antroforceps bolivari* Barr, 1967 from Mexico or in completely eyeless *Neoreicheia* Kult, 1950. The latter genus includes three or four species in Brazil and Caribbean and at least one more undescribed species from Bolivia; this genus has been recently placed by Lorenz (1998) in synonymy with *Oxydrepanus* Putzeys, 1866. It is therefore apparent that a relatively little degree of confidence should be assigned to taxa united exclusively, or predominantly, by “reduction” features associated with an endogean lifestyle. Three other morphological features used to define Reicheiina by Basilewsky (1980) are potentially less dependent on the mode of life and, therefore, are more reliable to carry an informative phylogenetic signal. Members of Reicheiina have the posterior angles of the pronotum completely obliterated and rounded, a character state also found in eyed *Trilophidius*. Two other characters are unique within the tribe Clivinini to the majority of Reicheiina species: a relatively short pronotal peduncle and the lack of a basal annular constriction on the pronotum. Monophyly of Reicheiina is, therefore, an open question with a distinct possibility that the group might be an artificial assemblage of different endogean Clivinini.

**Composition of Reicheiina.** The presently employed concept of Reicheiina follows that of Basilewsky (1980: 293) in delimiting it equal to the “séries phylétique de *Reicheia*” sensu Jeannel (1957; i.e. excluding the genus *Trilophidius* Jeannel, 1957 and some other taxa; see below). As currently defined, the following 16 genera are included in Reicheiina (arranged alphabetically):

01. *Alpiodytes* Jeannel, 1957: 2 spp., Italy.
02. *Antireicheia* Basilewsky, 1951: 47 spp., Madagascar, South Africa, Tanzania, DRC, Rwanda; one additional aberrant species is known from Vietnam (Balkenohl, 2005).
03. *Catalanodytes* Sciaky, 1989: 1 sp., Spain.
04. *Chaetomargoreicheia* Magrini et Bulirsch, 2005: 2 spp., Serbia and Montenegro.
05. *Dalmatoreicheia* Magrini et Bulirsch, 2005: 2 sp., Croatia and Albania.
06. *Dimorphoreicheia* Magrini, Fancello et Leo, 2002: 2 spp., Italy: Sardinia.
07. *Iberodytes* Jeannel, 1949: 1 sp., Portugal.
08. *Kenyoreicheia* Bulirsch et Magrini, 2007: 1 sp., Kenya (Aberdare Mts.).
09. *Laoreicheia* Balkenohl, 2005: 1 sp., Laos.
10. *Orienteicheia* Bulirsch et Hürka, 1994: 4 spp., Israel, Georgia, Russia, Turkey.
11. *Parareicheia* Jeannel, 1957: 3 spp, Iberian Peninsula.
12. *Reicheadella* Reitter, 1913: 7 spp., Balkan Peninsula.
13. *Reicheia* Saulcy, 1862: 22 spp., Algeria, Tunis, Italy, Spain (incl. Balear Islands), France (incl. Corsica); one additional aberrant species is known from Japan (Balkenohl, 2005).
14. *Reicheidius* Jeannel, 1957: 1 sp. Bosnia and Herzegovina, Croatia, Montenegro.
15. *Spelaeodytes* Miller, 1863: 1 sp. Bosnia and Herzegovina, Croatia.
16. *Typhloreicheia* Holdhaus, 1924: 66 spp., Italy (incl. Sardinia, Sicily and Elba).



**FIGURE 30.** World distribution of the subtribe Reicheiina (right) and type localities of four new Cameroonian *Antireicheia* species (left). Note disjunctive distribution of Reicheiina species in three distinct geographical regions: the Mediterranean region with 13 endemic Reicheiina genera and the majority of the species; the Afrotropical Region with two endemic genera (*Antireicheia* and monotypic *Kenyoreicheia*) and the Asian region with three species known only from holotypes and only provisionally assigned to genera.

A few taxa have been cited as either potentially belonging, or closely related, to the subtribe Reicheiina (i.e. Balkenohl, 2003): the monotypic *Italodytes* Müller, 1938 from Italian caves, *Syleter* Andrewes, 1941 (three Afrotropical and 10 Oriental species; Balkenohl, 2001), *Psilidius* Jeannel, 1957 (two Afrotropical species; Basilewsky, 1959), *Leleuporella* Basilewsky, 1956 (two Afrotropical species and one from Sri Lanka; Balkenohl, 1997), *Trilophus* Andrewes, 1927 (28 species in the Oriental Region, Balkenohl, 1999) and *Trilophidius* Jeannel, 1957 (13 Afrotropical species and six more from the Oriental Region, Balkenohl, 2001). We do not consider them members of the subtribe Reicheiina.

**Biogeography of Reicheiina.** Jeannel (1957: 201) without providing much evidence hypothesised that Reicheiina originated from the Afrotropical Region and then colonised the Mediterranean Region. Leleup (1965; fig. 11) further elaborated on this hypothesis by stating that Reicheiina had originated in South Africa, dispersed to Madagascar and East Africa, and from East Africa to the Mediterranean Region. These intuitive hypotheses, however, remain not critically tested using adequate phylogenetic methodology. The first step in this direction would be a focused effort to test monophyly of Reicheiina and infer its internal interrelationships. Such task, however, is outside of the scope of the present paper.

## Acknowledgements

Philippe Bruneau de Miré (Paris, France), Thierry Deuve and Azadeh Tagavian (both MNHN) loaned us the type material and donated specimens of African Reicheiina. Fieldwork in Cameroon for VVG was supported by a research grant provided by Elisabeth Hintelmann (Munich, Germany) through a scientific foundation she established at the Zoologische Staatssammlung München ([http://www.zsm.mwn.de/events/wiss\\_preise.htm](http://www.zsm.mwn.de/events/wiss_preise.htm))

in memory of her late husband Robert J. H. Hintelmann. Eduard Jendek, Karen McLachlan Hamilton, and Louise Dumouchel (all from Ottawa, Canada) critically read this text before submission, while Riccardo Sciaky (Milan, Italy) reviewed it. We sincerely acknowledge help from these individuals.

## References

- Andrewes, H.E. (1927) Papers on Oriental Carabidae. XX. *Annals and Magazine of Natural History*, Series 9, 20, 263–272.
- Andrewes, H.E. (1941) Papers on Oriental Carabidae - XXXVII. *Annals and Magazine of Natural History*, Series 11, 7, 307–317.
- Balkenohl, M. (1997) *Leleuporella sexangulata* sp. n. from Sri Lanka, a *Leleuporella* species outside the Ethiopian [sic] realm (Coleoptera, Carabidae). *Revue Suisse de Zoologie*, 104, 605–609.
- Balkenohl, M. (1999) Revision of the genus *Trilophus* Andrewes from the Oriental region (Coleoptera, Carabidae). *Revue Suisse de Zoologie*, 106, 429–537.
- Balkenohl, M. (2001) *Key and Catalogue of the Tribe Clivinini from the Oriental Realm, with Revisions of the genera Thliboclivina Kult, and Trilophidius Jeannel (Insecta, Coleoptera, Carabidae, Scarititae, Clivinini)*, Pensoft Series Faunistica No. 21, Sofia-Moscow, Pensoft, 86 pp.
- Balkenohl, M. (2003) Subfamily Scaritinae Bonelli, 1810. In: Löbl, L. & Smetana, A. (Eds.), *Catalogue of Palearctic Coleoptera. Vol. 1. Archostemata – Myxophaga – Adephaga*. Apollo Books, Stenstrup, pp. 219–234.
- Balkenohl, M. (2005) First record of *Reicheiina* species from the Oriental Region and Japan (Coleoptera, Carabidae, Scarititae, Clivinini). *Coleoptera*, 9, 1–10.
- Barr, T.C. (1967) *Antroforceps*, an eyeless cave Scaritine from Mexico (Coleoptera: Carabidae). *The Coleopterists' Bulletin*, 21, 65–70.
- Basilewsky, P. (1951a) Description d'un Scaritidae aveugle du Kivu (Col. Carabidae, Scaritinae). *Revue de Zoologie et de Botanique Africaines*, 44, 267–269.
- Basilewsky, P. (1951b) Quelques *Reicheia* nouvelles de l'Est du Congo belge (Col. Carabidae, Scaritinae). *Revue de Zoologie et de Botanique Africaines*, 45, 134–141.
- Basilewsky, P. (1953) Descriptions de trois Carabiques anophtalmes nouveaux du Ruanda-Urundi et du Kivu (Col. Carabidae). *Revue de Zoologie et de Botanique Africaines*, 47, 171–176.
- Basilewsky, P. (1956) Coléoptères recueillis par N. Leleup au Lac Tumba. I. Carabidae. *Revue de Zoologie et de Botanique Africaines*, 53, 418–434.
- Basilewsky, P. (1959) Sur les genres *Syleter* Andrewes, *Psilidius* Jeannel et *Leleuporella* Basilewsky (Col. Carabidae Scaritinae). *Revue Française d'Entomologie*, 26, 5–26.
- Basilewsky, P. (1960) Coléoptères Carabidae de Mont Kabobo recueillis par N. Leleup. *Revue de Zoologie et de Botanique Africaines*, 62, 66–90.
- Basilewsky, P. (1962) Mission zoologique de l'I.R.S.A.C. en Afrique orientale. (P. Basilewsky et N. Leleup, 1957). LX. Coleoptera Carabidae. *Annales du Musée Royal de l'Afrique Centrale*, 107, 48–337.
- Basilewsky, P. (1973) *Faune de Madagascar 37. Insectes Coléoptères. Carabidae, Scaritinae I*. Paris: Muséum National d'Histoire Naturelle, 322 pp.
- Basilewsky, P. (1976) Mission entomologique du Musée Royal de l'Afrique Centrale aux Monts Uluguru, Tanzanie (L. Berger, N. Leleup et J. Debecker, V–VIII.1971). 19. Coleoptera Carabidae. *Revue de Zoologie et de Botanique Africaines*, 90, 671–721.
- Basilewsky, P. (1980) Les *Reicheiina* de l'Afrique du Sud (Coleoptera: Carabidae). *Entomologia Generalis*, 6, 293–302.
- Bruneau de Miré, P. (1986) Anillini du Cameroun (Coleoptera, Carabidae, Trechinae). *Annales de la Société Entomologique de France*, 22, 299–304.
- Bulirsch, P., Janák, J. & Moravec, P. (2005) New species and findings of Scaritinae (Coleoptera: Carabidae) from Madagascar. *Studies and Reports of District Museum Prague-East. Taxonomical Series*, 1(1–2), 1–35.
- Bulirsch, P. & Hůrka, K. (1994) *Orienteicheia* gen. n., and *O. caucasica rousi* subsp. n., new taxa of subtribe *Reicheiina* from the west Caucasus (Coleoptera: Carabidae: Clivinini). *Acta Societatis Zoologicae Bohemicae*, 57(1993), 161–166.
- Bulirsch, P. & Magrini, P. (2006) Three new species in the genus *Antireicheia* Basilewsky, 1951, from South Africa (Coleoptera: Carabidae, Scaritinae: Reicheina [sic]). *Annals of the Transvaal Museum*, 43, 77–87.
- Bulirsch, P. & Magrini, P. (2007) Descriptions of four new species and *Kenyoreicheia* gen. n. of the subtribe *Reicheina* [sic] (Coleoptera: Carabidae: Scaritinae) from East Africa. *Studies and reports of District Museum Prague-East. Taxonomical Series*, 3(1–2), 17–30.
- Deuve, T. (2003) Un Clivinini troglobie anophtalme d'un karst de Nouvelle-Bretagne, en Papouasie-Nouvelle Guinée

- (Coleoptera, Caraboidea, Scaritidae). *Nouvelle Revue d'Entomologie (N.S.)*, 20, 231–235.
- Ganglbauer, L. (1892) *Die Käfer von Mitteleuropa. Die Käfer der österreichisch-ungarischen Monarchie, Deutschlands, der Schweiz, sowie des französischen und italienischen Alpengebiets. Erste Band. Familieneihe Caraboidea*. Wien, Carl Gerold's Sohn, iii+557 pp.
- Holdhaus, K. (1924) Monographie du genre *Reicheia* Saulcy (Coleoptera Carabidae). *L'Abeille, Journal d'Entomologie*, 32, 161–220.
- Jeannel, R. (1949) Un Scaritide endogé nouveau du Portugal. *Revue Française d'Entomologie*, 16, 161–163.
- Jeannel, R. (1957) Révision des petits Scaritides endogés voisin de *Reicheia* Saulcy. *Revue Française d'Entomologie*, 24, 129–212.
- Jeannel, R. (1958) Un nouvel *Afroreicheia* du Kivu. *Revue Française d'Entomologie*, 25, 160–170.
- Kult, K. (1950) New neotropical species of the group Ardistominina (Carabidae, Coleoptera). *Arthropoda, Buenos Aires*, 1, 299–325.
- Leleup, N. (1965) La faune entomologique cryptique de l'Afrique intertropicale. *Musée Royal de l'Afrique Centrale, Annales, Serie in-8°, Sciences Zoologiques*, 141, ix+186 pp.
- Lorenz, W. (1998) Nomina Carabidarum : a directory of the scientific names of ground beetles (Insecta, Coleoptera "Geadephaga": Trachypachidae and Carabidae incl. Paussinae, Cicindelinae, Rhysodinae). Privately published, Tutzing, Germany, 937 pp.
- Magrini, P., Fancello, L. & Leo, P. (2002) Un nuovo genere e una nuova specie di Reicheiina della Sardegna (Coleoptera Carabidae Scaritinae). *Redia*, 84 (2001), 141–149.
- Magrini, P. & Bulirsch, P. (2005) Un nuovo genere, un nuovo sottogenere e due nuove specie di scaritini anoftalmi della regione Adriatica Orientale (Insecta Coleoptera Carabidae Scaritinae). *Quaderno di Studi e Notizie di Storia Naturale della Romagna*, 20, 83–99.
- Miller, L. (1863) Ein neuer Grottenkäfer aus der Gruppe der Scaritiden. *Wiener Entomologische Monatschrift*, 7, 28–30.
- Müller, G. (1938) *Italodytes stammeri*, nuovo genere e nuova specie di carabidi cavernicoli dell'Italia meridionale. *Atti del Museo Civico di Storia Naturale di Trieste*, 13, 135–139.
- Péringuey, L. (1896) Descriptive catalogue of the Coleoptera of South Africa. *The Transactions of the South African Philosophical Society*, 7, 99–623.
- Putzeys, J. (1866) Révision générale des Clivinides. *Annales de la Société Entomologique de Belgique*, 10, 1–242.
- Reitter, E. (1913) Beschreibung neuer Coleopteren. *Entomologische Blätter*, 9, 64–67.
- Saulcy, F. de (1862) Observations sur les genres *Choleva*, *Catops* et *Catopsimorphus* et remarques sur le nouvelle catalogue de M. Schaum suivies de la description de deux nouveaux genres et de quatre nouvelles espèces de coléoptères à la faune française. *Annales de la Société Entomologique de France*, (4)2, 281–291.
- Sciaky, R. (1989) Una nuova specie e un nuovo genere di Reicheiini della Penisola Iberica (Coleoptera, Carabidae) (21° contributo alla conoscenza dei Coleoptera Carabidae). *Bollettino della Società Entomologica Italiana*, 121, 90–97.