



## A new genus and three new species of Pterostichini (Coleoptera: Carabidae) from Mêdog, China

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### Abstract

This study deals with the taxonomy of the tribe Pterostichini (Coleoptera: Carabidae) from Mêdog County, Xizang, China, where we describe one new genus, *Medogia* Wang & Shi **gen. nov.** (type species: *Medogia mirabilis* **sp. nov.**), and three new species: *Medogia mirabilis* Wang & Shi **sp. nov.** (type locality: Mêdog, 62K, 2794 m), *Medogia melanaria* Shi & Wang **sp. nov.** (type locality: Mêdog, Lage, 3270 m), and *Pterostichus* (*Circinatus*) *medogensis* Shi & Wang **sp. nov.** (type locality: Mêdog, 62K, 2794 m). To verify the establishment of the new genus, a preliminary phylogenetic analysis based on molecular data was conducted. As a result of this study, the Pterostichini fauna of Mêdog County comprises eight species, categorized as follows: three new species described herein, two species newly recorded from the county [*Pterostichus* (*Pseudethira*) *rugosiceps* Schmidt, 2012 and *Nirmala odelli* Andrewes, 1930], and three previously recorded species. Additionally, the male genitalia of *P. rugosiceps* are described and illustrated for the first time.

**Key words:** ground beetles, *Myas* complex, taxonomy, phylogeny, Himalaya

### Introduction

Mêdog County, situated in southeastern Xizang and along the lower reaches of the Yarlung Zangbo River, lies at the heart of the Eastern Himalaya—a biodiversity hotspot area of the tropical forest biome (Myers 1988). Due to its remote location and a lack of field investigations, the fauna of several insect groups has remained poorly studied. Based on nearly two decades of continuous field surveys in Mêdog County conducted by the Institute of Zoology, Chinese Academy of Sciences, a substantial number of carabid specimens have been collected and identified. These efforts have led to the description of several endemic and rare new species (Zhu *et al.* 2018; Shi & Liang 2018; Yan *et al.* 2021). Nevertheless, compared with the remarkable species richness and endemism, the current knowledge of the Carabidae fauna in Mêdog remains far from comprehensive.

The tribe Pterostichini Bonelli, 1810 represents an essential component of mountain carabid beetle communities in China, exhibiting remarkable diversity in the Hengduan Mountains and Qinling-Daba Mountains. While most described Pterostichini species from the Himalaya are concentrated on the southern slopes of its central segment, particularly in Nepal (Schmidt 2006), only about a dozen species have been recorded on the Xizang side. Our study has identified eight Pterostichini species in Mêdog. Although the species richness is moderate, the taxonomic placement of three undescribed species initially posed significant systematic challenges, underscoring their unique phylogenetic position.

Of these species, two can be readily identified as members of the *Myas* complex (*sensu* Bousquet 1999, i.e. subtribe Myadi *sensu* Allen 1980); however, their morphological characteristics are not in accord with either *Aristochroa* Tschitschérine, 1898 or *Trigonognatha* Motschulsky, 1858. Considering the morphological consistency of these two species and their intermediate character combinations between the genera *Aristochroa* and *Trigonognatha*, a new

genus is hereby proposed to accommodate them. Furthermore, subsequent phylogenetic analyses have supported the establishment of this new genus, indicating that it represents an early lineage within the *Myas* complex. Additionally, another undescribed species within the *Pterostichus* subgenus *Circinatus* Sciaky, 1996 (Sciaky 1996) exhibits an atypical habitus for the subgenus and has a distribution range far from that of the other known species.

Therefore, the primary objective of the present study is to describe new taxa of the tribe Pterostichini from Mèdog County, including one new genus within the *Myas* complex, two new species of this new genus, and one new species of the *Pterostichus* subgenus *Circinatus*. All new taxa are comprehensively described and diagnosed, accompanied by illustrations of their habitus, male genitalia, and other key morphological characters, together with an identification key to the Palearctic genera of the *Myas* complex.

To further substantiate the establishment of the new genus, a molecular phylogenetic analysis was performed on the Palearctic genera of the *Myas* complex, and the systematics of these genera are briefly discussed. Additionally, the Pterostichini fauna of Mèdog is reviewed, with a total of eight species recorded, two of which are newly recorded for this county. The male genitalia of *Pterostichus rugosiceps* Schmidt, 2012 are described and illustrated for the first time, and a compiled identification key to all Pterostichini species in Mèdog is also provided.

## Material and methods

The present study is mainly based on the examination of specimens from Mèdog County, Xizang. Most of specimens examined, including types of new species, are deposited in the collections of the Institute of Zoology, Chinese Academy of Sciences (IZCAS), Beijing, China. A few other specimens are in the collection of Forestry Entomology Laboratory, Beijing Forestry University (CBFU), Beijing, China.

The methods, terminology and taxonomic treatment mainly follow our previous works (Shi & Liang 2015; Yin *et al.* 2024). The satellite map of Mèdog County was cited from the website of Ministry of Natural Resources of Xizang Autonomous Region, and the background map of Nyingchi District (where Mèdog County belongs) was made with QGIS 3.28 (Figs 11, 12). The body length (BL) was measured from the apical margin of the labrum to the elytral apex; the width of head (HW) was measured along the greatest transverse distance of head including eyes; the pronotum width (PW) was measured along its greatest width; pronotum length (PL) was measured along its median line; pronotum basal width (PBW) was measured along its posterior margin; elytra width (EW) was measured along the greatest width of closed elytra.

## Taxa and sequences

Representatives of all Palearctic genera of the *Myas* complex (*sensu* Bousquet 1999) were selected as in-groups of the molecular phylogenetic analysis, including nineteen species belonging to five genera. The number of included species is listed after each genus; the total number of described species of each genus is in parentheses. *Aristochroa* Tschitschérine, 1898, 8 (32); *Trigonognatha* Motschulsky, 1858, 8 (37); *Myas* Sturm, 1826, 1 (1); *Xenion* Tschitschérine, 1902, 1 (1); *Medogia* **gen. nov.**, 1 (2). Based on current phylogenetic hypotheses for the tribe Pterostichini (Sasakawa & Kubota 2007), two species of the genus *Pterostichus* and one species of the genus *Stomis* are chosen as out-groups.

The molecular phylogenetic analyses were conducted using sequences from the mitochondrial cytochrome c oxidase subunit I (COI) gene and the nuclear 28S ribosomal DNA (28S rDNA). Outgroup sequences were retrieved from NCBI. For in-group taxa, total genomic DNA was extracted from a middle leg of the adults preserved in 95–100% ethanol, using the Qiagen Dneasy Kit. Polymerase chain reaction (PCR) was used to amplify the target gene fragments. Specifically, the COI fragment (ca. 658 bp) was amplified with primers LCO1490 and HCO2198 (Folmer *et al.* 1994), and the 28S rDNA fragment covering the D1–D3 regions (ca. 1050 bp) was amplified with primers D1 and D3i (Ober 2002). The primers and PCR conditions used in this study are summarized in Table 1 and Table 2, respectively.

Sequences were assembled by SeqMan II (DNASTar, Inc. 1996, Madison, WI, USA) and verified for protein coding frame-shifts using EditSeq (DNASTar). All gene regions were aligned with ClustalX 1.83 under default settings (Thompson *et al.* 1997) and manual adjusted where necessary.

**TABLE 1.** Primers used for PCR amplification in this study.

Gene	Primer Name	Sequence (5' to 3')	Reference
COI	LCO1490	GGT CAA CAA ATC ATA AAG ATA TTG G	Folmer <i>et al.</i> 1994
COI	HCO2198	TAA ACT TCA GGG TGA CCA AAA AAT CA	Folmer <i>et al.</i> 1994
28S rDNA	D1	GGG AGG AAA AGA AAC TAA C	Ober 2002
28S rDNA	D3i	GCA TAG TTC ACC ATC TTT C	Ober 2002

**TABLE 2.** PCR conditions used in this study.

Conditions	Genes	
	COI	28S rDNA
Pre-denaturation	95°C, 5min	94°C, 2min
Denaturation	95°C, 30s	94°C, 20s
Annealing	50°C, 30s	53°C, 17s
Elongation	72°C, 1min	65°C, 50s
No. of cycles	40	35
Post-elongation	72°C, 10min	72°C, 7min

## Phylogenetic analysis

The phylogenetic analysis was performed using PhyloSuite v1.2.2 (Zhang *et al.* 2020). Phylogenetic relationships were reconstructed based on Bayesian inference (BI). First, the COI and 28S gene sequences were aligned separately using MAFFT (Kato & Standley 2013) with the G-INS-i (accurate) strategy. The resulting alignments were then trimmed with GBlocks (Talavera & Castresana 2007) under default parameters to remove poorly aligned positions and divergent regions.

The best-fit partitioning scheme and nucleotide substitution models were selected using PartitionFinder2 v2.1.1 (Lanfear *et al.* 2017) with the greedy search algorithm under the Bayesian Information Criterion (BIC). Finally, Bayesian inference was conducted in MrBayes 3.2.6 (Ronquist *et al.* 2012) using a partition model. The analysis employed the HKY+I+G model for COI and the JC+I+G model for 28S, with two parallel runs of 2 million generations each. The first 25% of sampled trees and parameters were discarded as burn-in.

## Taxonomy

### *Medogia* Wang & Shi gen. nov.

Type species: *Medogia mirabilis* sp. nov.

**Etymology.** The name *Medogia* derives from Mèdog, the county where the new genus is distributed. The genus name is feminine in gender.

**Diagnosis.** The genus can be distinguished from other Asian Pterostichini genera by following combination of characteristics: glossal sclerite with four to six setae on anterior margin; terminal labial palpomere nearly fusiform, apical margin truncate or subpointed, slightly narrower than widest point near apical third (Fig. 1A, B); mentum tooth strongly elevated, sharply declined anterior to marginal ridge of mentum (Fig. 2A, B); pronotum strongly cordate, with one mid-lateral seta; elytra normally without discal setigerous pores, odd intervals usually slightly wider than even ones (Fig. 4A, B, C); angles of basal elytral margin connected with lateral elytral margin well rounded, humeral tooth absent (Fig. 3A); abdominal sternite VII with two setae in males.

**Generic characters.** Medium-sized pterostichid beetles, BL = 11.8–13.7 mm; dorsum metallic or black, with strong luster.

Head. Frontal impressions deep, extending behind midpoint of eyes. Eyes prominent, tempora shortly swollen behind eyes. Antennae short, fourth antennomere pubescent except on its basal fourth. Labial palpomere 3 nearly fusiform, apical margin slightly narrower than widest point near apical third (Fig. 1A, B); labial palpomere 2 bisetose on inner margin, with one short seta near outer apical angle; glossal sclerite (ligula) with four to six setae on anterior margin, outer ones much shorter than median pair; mentum shallowly concave aside central region, without labial pits; mentum tooth narrow, apex more or less emarginate, apical marginal ridge of mentum strongly elevated at middle of tooth, mentum tooth sharply declined anterior to marginal ridge; middle of marginal ridge simple in *M. mirabilis* (Fig. 2A), but strongly projected in *M. melanaria*, forming triangular ridge and covering major portion of mentum tooth (Fig. 2B). Submentum distinctly ridged, with two setae on each side.

Pronotum strongly cordate, lateral margins strongly sinuate before posterior angles; posterior angles rectangular, without denticle; basal margin subequal to head width; lateral margins slightly crenulate along their entire length. Lateral bead equally narrow, with one mid-lateral seta and one posterior seta. Disc slightly convex, more or less wrinkled, median line fine and entire, anterotransverse sulcus obsolete; basal fovea composed of two parallel longitudinal sulci, inner sulcus deeper and slightly longer than outer one, intersulcate area (Yin *et al.* 2024: 46) carinate, basal area impunctate.

Elytra ovate, slightly widened to apex, widest near apical third. Basal ridge complete, connected to parascutellar striae; humeral angles rounded, humeral tooth absent. Intervals shallowly convex; odd intervals similarly or slightly more convex than even ones; intervals 3, 5, 7 more or less wider than rest, all intervals with similar isodiametric microsculpture (Fig. 4A, B, C). Striae finely incised, impunctate; parascutellar striae short, with apices free. Parascutellar pore absent; interval 3 normally without discal setigerous pores, occasionally with one pore behind middle as individual aberrant; interval 7 with one or two pores near apex; umbilicate series on interval 9 sparser at middle, composed of 16–20 pores. Epipleura tapered to apex, with distinct apical plica.

Ventral side. Metaepisternum subquadrate, glabrous or finely punctate. Sternite VII without secondary sexual modification, apex with one pair of setae in males, two pairs in females.

Legs. Protibia with two clip setae; with three ventroapical spines on ventroapical tubercle, outer lateral one sometimes distant from other two tubercles; ventroapical tubercle and insertion of clip spur connected by entire sharp ridge. Mesotibial ctenidium (Bousquet 1999: 13) poorly differentiated in females, slightly more evidently differentiated in males. Mesotrochanter with one seta; mesofemur with two posterior setae on ventral side; metacoxa with two setae; metatrochanter without seta. Outer surface of metatarsus not carinate or weakly carinate on basal half of tarsomere 1; metatarsomeres one to two with two pairs of dorso-apical setae, tarsomeres three to four with one pair of dorso-apical setae; metatarsomere 5 with two or three pairs of fine ventral setae and one pair of long dorsal setae.

Male genitalia. Apical orifice dorsal, not bent to right or left side; apical lamella large, triangular or subquadrate; apical portion of median lobe more or less inclined to right side; right paramere small, apex narrow (Fig. 6F, 8E); left paramere with transverse apophysis, dorsally concave with oblique ridge (Fig. 6E, 8D). Endophallus cystic, short and straight, located on dorso-apical side of aedeagus; gonopore opened to dorso-apical direction of aedeagus; endophallus with five small lobes, some of which distinctly scaled or pigmented.

Female genitalia. Gonocoxite II stout, apex widely rounded, without ensiform or nematiform setae. Spermatheca long, coiled at apex, spermathecal gland much longer than spermatheca, inserted near base of spermatheca.

**Distribution and diversity.** The new genus comprises only two new species described herein: *M. mirabilis* **sp. nov.** and *M. melanaria* **sp. nov.** Both species are endemic to Médog County in the southeastern part of the Xizang Autonomous Region, China. All collection localities are situated on the southern slope of the Gangri Gabu and Namcha Barwa mountains, at altitudes ranging from 2,000 m to 3,270 m. Most type specimens of *M. mirabilis* were collected using pitfall traps, or found under rocks and dead woods within cloud forests (Fig. 13).

**Taxonomic comments.** The morphology of the new genus *Medogia* exhibits intermediate states between the genera *Aristochroa* and *Trigonognatha*, a conclusion further supported by preliminary phylogenetic analysis of COI and 28S genes (Fig. 5). A detailed systematic discussion of *Medogia* **gen. nov.** and its related taxa are provided in the section of phylogenetic analysis.

Beyond molecular evidence, the new genus has a habitus resembling certain species of *Aristochroa* and the *vignai*-group of *Trigonognatha* (*Trigonognatha* clade II in Fig. 5; for details, see the phylogenetic analysis part), while also possessing distinctive characters typical of *Aristochroa* or the majority of *Trigonognatha* (*Trigonognatha* clade I in Fig. 5). *Medogia* **gen. nov.** shares similarities with some species of *Aristochroa* in the fusiform terminal

labial palpomere, slightly heterogeneous elytra interval, and somewhat elongated apical lamella of aedeagus. Specifically, in *M. melanaria* **sp. nov.**, the apex of aedeagus is very similar to that of some *Aristochroa* species, such as *A. freyi* Straneo, 1938; and the pronotal shape of *Medogia* **gen. nov.** is also comparable to species like *A. abrupta* Kavanaugh & Liang, 2006. Conversely, the new genus also exhibits characters exclusive to the major part of *Trigonognatha* (clade I), such as the non-angulate angle of basal elytral margin connected with lateral elytral margin (Fig. 3A, B) and the mentum with very strongly elevated marginal ridge on the base of mentum tooth (Fig. 2A, B).

Most species of the genus *Aristochroa* possess two or more mid-lateral setae on the pronotum and have distinctly wider odd-numbered elytral intervals that differ in texture and/or elevation from the even-numbered ones (Fig. 4I, J). These characters readily distinguish them from *Medogia* **gen. nov.** in most cases. An exception is *A. mosuo* Tian, 2004, which shares an important similarity with the new genus: it has only one mid-lateral seta on the pronotum. Additionally, *A. mosuo* and a few other *Aristochroa* species exhibit homogeneous elytral intervals (no distinction in texture or elevation between odd and even intervals, Fig. 4D, E). In addition, *Medogia* **gen. nov.** can be distinguished from these species of *Aristochroa* by the following three characters: elytra humeral angles rounded (Fig. 3A); the carina on the outer surface of metatarsus more reduced; and the mentum tooth more distinctly elevated and apically declined (Fig. 2A, B). *Aristochroa cavazzutii* (Casale & Sciaky, 1994) was originally described under the genus *Trigonognatha* as *Trigonognatha cavazzutii* Casale & Sciaky, 1994. However, examination of the original literature, photographs of type specimens, and dissection of specimens from the type locality revealed that its characteristics do not align with the genus *Trigonognatha* but instead match those of the genus *Aristochroa*. These key characteristics include: the second palpomere of both the maxillary and labial palps being spindle-shaped rather than triangular; the lateral margins of the pronotum bearing two to four setae in the anterior half (as opposed to a single seta in the type species of *Trigonognatha*). Although some smaller species later identified as *Trigonognatha* also exhibit multiple setae on the pronotal margins, phylogenetic studies indicate they do not form a monophyletic group with typical *Trigonognatha* species, suggesting misidentification rather than true membership in the genus); and the basal edge of the elytral humerus forming a distinct angle with the lateral margin rather than a smooth curve. Consequently, this species is hereby transferred from *Trigonognatha* to *Aristochroa*. Molecular evidence further supports the conclusion that this species belongs to the genus *Aristochroa* (Fig. 5).

The majority of *Trigonognatha* species (clade I) can be generally distinguished from *Medogia* **gen. nov.** by their significantly larger body size and stouter body form. Moreover, these species of *Trigonognatha* have the following important characteristics that differentiate them from *Medogia* **gen. nov.**: terminal labial palpomere strongly securiform (Fig. 1F, G); mentum tooth short and very wide (Fig. 2F, G); submentum usually with two setae [except for *T. coreana* (Tschitschérine)]; male terminal sternite with four to six setae.

In the phylogenetic tree, the new genus is also related to the *vignai*-group of *Trigonognatha* (containing four described species, *T. vignai* Casale & Sciaky, 1994, *T. latibasis* Sciaky & Wrase, 1997, *T. cordicollis* Sciaky & Wrase, 1997, and *T. hubeica* Facchini & Sciaky, 2003). These two groups are similar in elytral interval characteristics and general habitus. However, species of the *Trigonognatha vignai*-group can be distinguished from *Medogia* **gen. nov.** by the following features: pronotum basal margin distinctly wider than head width; labial terminal palpomere slightly wider (Fig. 1D); elytral interval 3 nearly always with discal setigerous pores; elytra humeral angles right-angled, humeral tooth distinct (Fig. 3D); male metatarsomere 1 carinate on nearly full length of outer surface; and the mentum tooth less elevated and apically declined (Fig. 2D).

Compared to other Pterostichini species in the Himalayan region, the general habitus of *Medogia* **gen. nov.** is most similar to that of *Nirmala indica* (Hope, 1831), although these two genera are not actually closely related. *N. indica* has a set of important characteristics that distinguish it from *Medogia* **gen. nov.**: frons much less rugose; labial palpomere 2 without a seta near outer apical angle; glossal sclerite with two setae on anterior margin; pronotal basal fovea without incised outer sulcus; elytra with parascutellar pore; protibiae without well-defined ventroapical tubercle, ventroapical spines poorly differentiated from the apical ctenidium.

The two species included in *Medogia* **gen. nov.** differ significantly in the apex of the male aedeagus (Fig. 6C, 8C). Nevertheless, they conform to one another in several key aspects of external morphology, including: pronotum cordate and strongly constricted to the base; the angles of basal elytral margin connected with lateral elytral margin rounded, humeral tooth absent; mentum tooth with strongly elevated ridge, sharply declined anterior to the ridge. These distinctive and uncommon characteristics support their congeneric placement, even though *M. melanaria* **sp. nov.** was not included in the molecular phylogenetic analysis.

A key is provided below for identifying the Palearctic genera related to the new genus *Medogia*. These five genera all possess four or more setae on the anterior margin of the glossal sclerite. They have been referred to as the *Myas* complex (Bousquet 1999) or the subtribe Myadi (Allen 1980). The Nearctic genus *Neomyas* is not included in either the key or the phylogenetic analysis. The genus *Trigonognatha* was treated as a subgenus of *Myas* by previous authors (Bousquet 1999; Sasakawa 2005). However, based on the results of our preliminary phylogenetic analysis and morphological study, it is recognized as a distinct genus in the present study.

**Phylogenetic analysis.** A phylogenetic analysis for all Palearctic genera of the *Myas* complex was conducted using a combined molecular dataset of COI and 28S genes, analyzed with Bayesian Inference (BI). In the phylogenetic tree (Fig. 5), all intergeneric nodes were well supported, with Bayesian posterior probabilities (BPP) exceeding 0.50. The monophyly of the genus *Aristochroa* was strongly supported. While the other species-rich genus, *Trigonognatha*, was recovered as paraphyletic, comprising two distinct monophyletic clades. This result suggests that *Trigonognatha* may require division into two separate genera. However, a formal taxonomic revision of *Trigonognatha* is beyond the scope of this study and will be addressed in future work.

The phylogenetic analysis reveals that *Medogia* **gen. nov.** forms an independent lineage not subsumed within any existing monophyletic genus, thereby supporting its status as a distinct genus. Morphologically, *Medogia* **gen. nov.** shares similarities with *Aristochroa* and the *Trigonognatha vignai*-group. Consistently, the phylogenetic analysis also revealed a congruent result, indicating that these three groups represent the early lineages within the *Myas* complex. In the broader phylogeny, the majority part of *Trigonognatha* (clade I) was recovered as the sister group to the genus *Xenion*, while the *Trigonognatha vignai*-group (clade II) constituted the basal branch of the *Myas* complex.

We have conducted phylogenetic analyses using different inference methods, evolutionary models, and taxon sets. Although the intergeneric relationships within the *Myas* complex frequently varied across these analyses, *Medogia* **gen. nov.** consistently formed an isolated clade related to *Aristochroa*. This stability under varied analytical conditions provides robust support for the validity of the new genus. Conversely, most other intergeneric relationships within the *Myas* complex remained unresolved.

Although the above phylogenetic conclusions are largely consistent with the results of morphological taxonomy, it should be particularly noted that the present analysis remains preliminary due to significantly limited molecular data. Such data used here, which we obtained nearly a decade ago, primarily serve as corroborative evidence for the establishment of the new genus in the present study. Consequently, an up-to-date molecular phylogeny is urgently expected in subsequent studies to provide more substantial scientific support for the current taxonomic conclusions or to revise them as necessary.

### Key to Palearctic genera of *Myas* complex

1. Glossal sclerite (ligula) with four or more setae on anterior margin ..... 2
- Glossal sclerite (ligula) with two setae on anterior margin ..... other genera of Pterostichini
2. Pronotum with two or more mid-lateral setae ..... 3
- Pronotum with one mid-lateral seta ..... 5
3. Terminal labial palpomere nearly fusiform, apical margin slightly narrower than widest point situated near middle or apical third (Fig. 1C); elytral odd intervals distinct wider than even ones, on middle portion of elytra, third interval at least 1.5 times as wide as fourth one (Fig. 4D, E, I, J); metatarsomere 1 weakly carinate on external surface (more distinctly in males) ..... *Aristochroa* Tschitschérine (most species)
- Terminal labial palpomere more or less triangular, widest on apical margin or equal in width on apical third (Fig. 1D, E); elytral intervals subequal in their width, on middle portion of elytra, third interval equally wide as fourth (Fig. 4F, G); metatarsomere 1 without trace of carina on external surface ..... 4
4. Third interval of elytra without setigerous pore; abdominal sternite VII with one pair of setae in males; pronotum rounded at sides, with lateral bead distinctly widened on posterior half ..... *Myas* Sturm
- Third interval of elytra with two setigerous pores; abdominal sternite VII with two pairs of setae in males; pronotum subquadrate, with lateral bead narrow all along ..... *Xenion* Tschitschérine
5. Terminal labial palpomere strongly securiform, inner margin 1.0–1.5 times as long as apical margin (Fig. 1F, G); protibia with three or more clip setae; abdominal sternite VII with two or three pairs of setae in males; mentum tooth wide and short, apex truncate or slightly emarginate (Fig. 2F, G); submentum with one seta on each side (except in *T. coreana*) .....  
..... *Trigonognatha* Motschulsky (most species, except for *vignai* species group)
- Terminal labial palpomere fusiform or narrowly triangular, inner margin at least 2.5 times as long as apical margin (Fig. 1A, D); protibia with two clip setae; abdominal sternite VII with one pair of setae in males; mentum tooth narrow, apex emarginate or pointed (Fig. 2A, D); submentum with two setae on each side ..... 6

6. Angles of basal elytral margin connected with lateral elytral margin rounded, humeral tooth absent (Fig. 3A, B); in males, metatarsomere 1 not or very faintly carinate on basal half of outer surface; mentum tooth strongly elevated at middle, sharply declined anterior to mentum marginal ridge (Fig. 2A, B); pronotum strongly cordate, width of basal margin subequal to that of head (PBW/HW = 0.96–1.01) ..... *Medogia* Wang & Shi **gen. nov.**
- Angles of basal elytral margin connected with lateral elytral margin right, humeral tooth small but distinct (Fig. 3C, D); in males, metatarsomere 1 carinate nearly all along outer surface; mentum tooth slightly elevated, weakly declined anterior to mentum ridge (Fig. 2C, D); pronotum cordate to subquadrate, width of basal margin much greater than that of head (PBW/HW = 1.22–1.64) ..... 7
7. Elytral intervals subequal in their width on middle portion of elytra, third interval only slightly wider than fourth one (Fig. 4H); third interval with one or two setigerous pores ..... *Trigonognatha* Motschulsky (*vignai*-group)
- Elytral odd intervals distinctly wider than even ones on middle portion of elytra, third interval at least 1.5 times as wide as fourth one (Fig. 4D, E); third interval usually without setigerous pore, with one or two pores in a few individuals ..... *Aristochroa mosuo* Tian

***Medogia mirabilis* Wang & Shi sp. nov.**

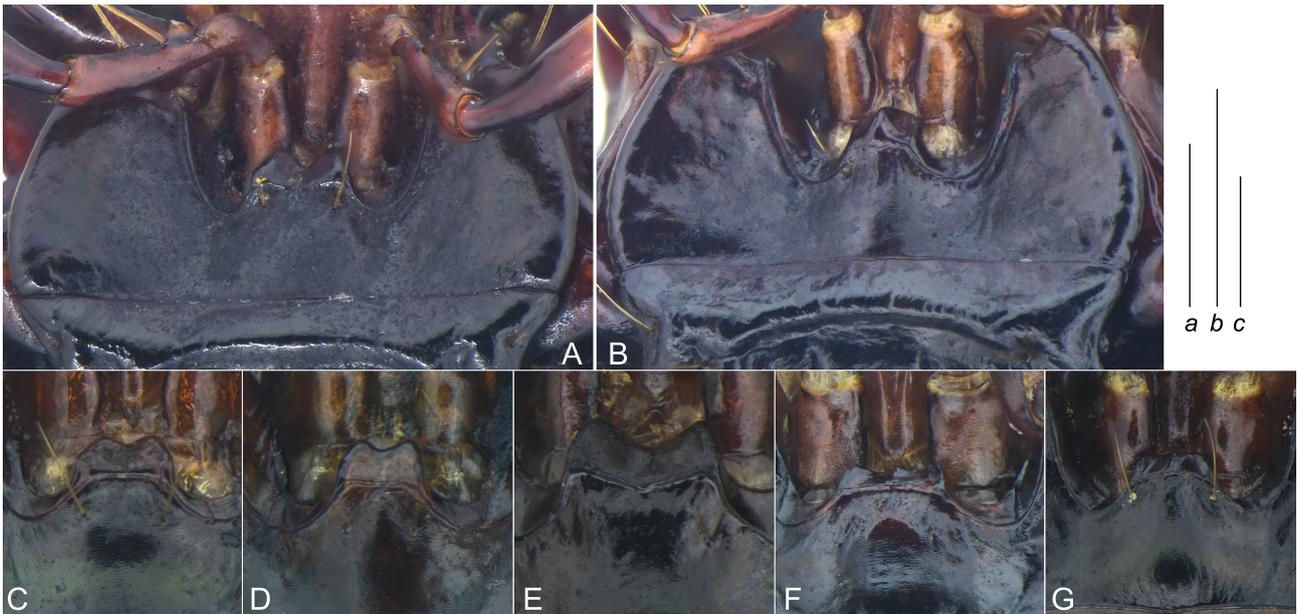
(Fig. 1A, 2A, 3A, 4A, B, 6, 7)

**Type material. HOLOTYPE: CHINA:** male (IZCAS), “CHINA, Xizang, Mêdog county, 62 km at road Bomê to Mêdog, mixed forest, 2794 m, N29.70937 E95.59230”, “2012.VII.27, by pitfall trap, LIANG Hongbin, SHI Hongliang, LIU Ye, WANG Yanan leg., Institute of Zoology, CAS”, **PARATYPES: CHINA:** (a total of 23 males and 19 females): 2 males and 1 female (IZCAS), same data as holotype; 2 males and 2 females (IZCAS), same data as holotype but date 2012.VII.26; 3 males & 1 female (IZCAS), “China, Tibet, Mêdog, 56 km on Mêdog road, Qinshui Diepu, N29.71644, E95.61029, 3040 m, 2020.9.18 D, Liang HB & Xu Y., pitfall. Institute of Zoology”; 2 males (IZCAS), “China, Tibet, Mêdog, 61 km on Mêdog Rd. Xirong valley”, “29.71299, 95.59807, 2809 m, 2019.7.26D, Xu Yuan, pitfall. Institute of Zoology”; 4 males and 1 female (IZCAS), “China, Tibet, Mêdog, 61 km on Mêdog Rd. Xirong valley”, “29.71326, 95.59691, 2864 m, 2020.9.16 D2, Liang HB, Xu Yuan, pitfall. Institute of Zoology”; 4 males and 5 females (IZCAS), same data but 2020.9.18 D2; 3 males (IZCAS), “Tibet, Mêdog, 63 km on Mêdog Rd., near Ramko hotel, 29.70625, 95.57284”, “2798 m, 2020.9.16 D1, Liang HB, Xu Yuan, pitfall, Institute of Zoology”; 6 males and 3 females (IZCAS), same data, but but 2020.9.18 D1; 1 male and 2 females (IZCAS), “Tibet, Mêdog, 63 km on Mêdog Rd., near Ramko hotel, 29.70625, 95.57284”, “2798 m, 2021.6.17-19, Liang HB, Xu Yuan, Institute of Zoology”; 3 females, “Tibet, Mêdog, 63 km on Mêdog Rd., near Ramko hotel, 29.70625, 95.57284”, “2798 m, 2024.7.19 Liang HB & Xu Y., pitfall. Institute of Zoology; 1 male (IZCAS), “China, Tibet, Mêdog, Zha-Mo road 28k (new) pitfall trap, N29.74352, E95.66999”, “2776 m, 2015.8.31 D3, Liang HB coll. IOZCAS”; 1 female (IZCAS), “China, Tibet, Mêdog 61 km from Bomi to Mêdog, under rocks, 29.70376N 95.56912E”, “2765 m, 2006.8.26 day, Liang H.B. collector, Institute of Zoology, Chinese Acad. Sciences”; 1 female (IZCAS), “Xizang, Bomi, 3050 m, 1982.IX.2, Lin Zai leg.” [in Chinese]; 1 male (IZCAS), “Xizang, Mêdog, 2000 m, 1983.VIII.20, Han Yinheng leg.” [in Chinese].

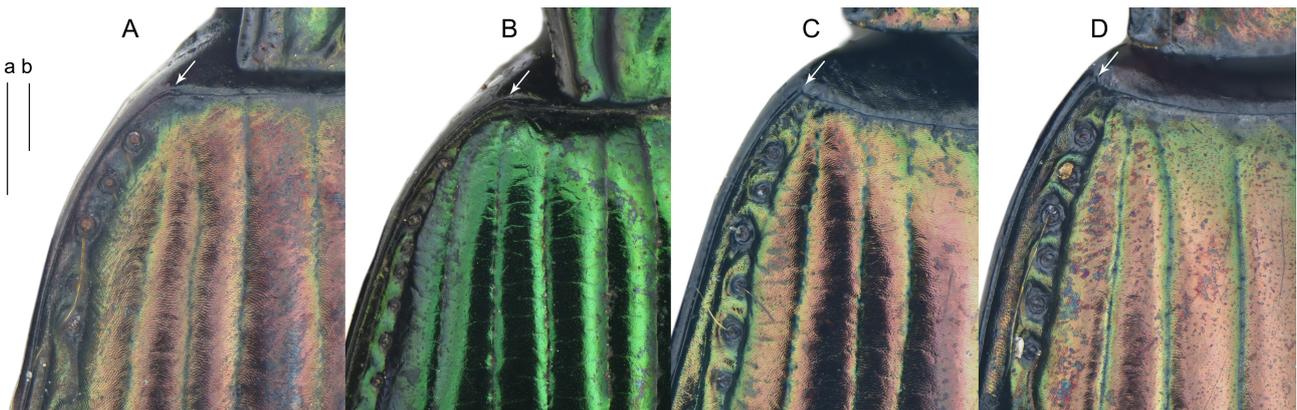
**Etymology.** The scientific name of the new species is derived from the Latin adjective *mirabilis*, meaning remarkable or peculiar. This epithet refers to the apical lamella of male aedeagus, which exhibits a distinctive morphology that differs from all known species within the genus and its allied genera.



**FIGURE 1.** Labial palpomere 3 (terminal palpomere) in males. **A.** *Medogia mirabilis* sp. nov. **B.** *Medogia melanaria* sp. nov. **C.** *Aristochroa mosuo* Tian. **D.** *Trigonognatha latibasis* Sciaky & Wrase. **E.** *Myas chalybaeus* (Palliard). **F.** *Trigonognatha becvari* Sciaky. **G.** *Trigonognatha coreana* (Tschitschérine). Scale bar = 0.5 mm.



**FIGURE 2.** Mentum tooth. **A.** *Medogia mirabilis* sp. nov. **B.** *Medogia melanaria* sp. nov. **C.** *Aristochroa mosuo* Tian. **D.** *Trigonognatha latibasis* Sciaky & Wrase. **E.** *Myas chalybaeus* (Palliard). **F.** *Trigonognatha coreana* (Tschitschérine). **G.** *Trigonognatha becvari* Sciaky. Scale bars = 0.5 mm; **a** for fig. A, B; **b** for fig. C, D, E; **c** for fig. F, G.

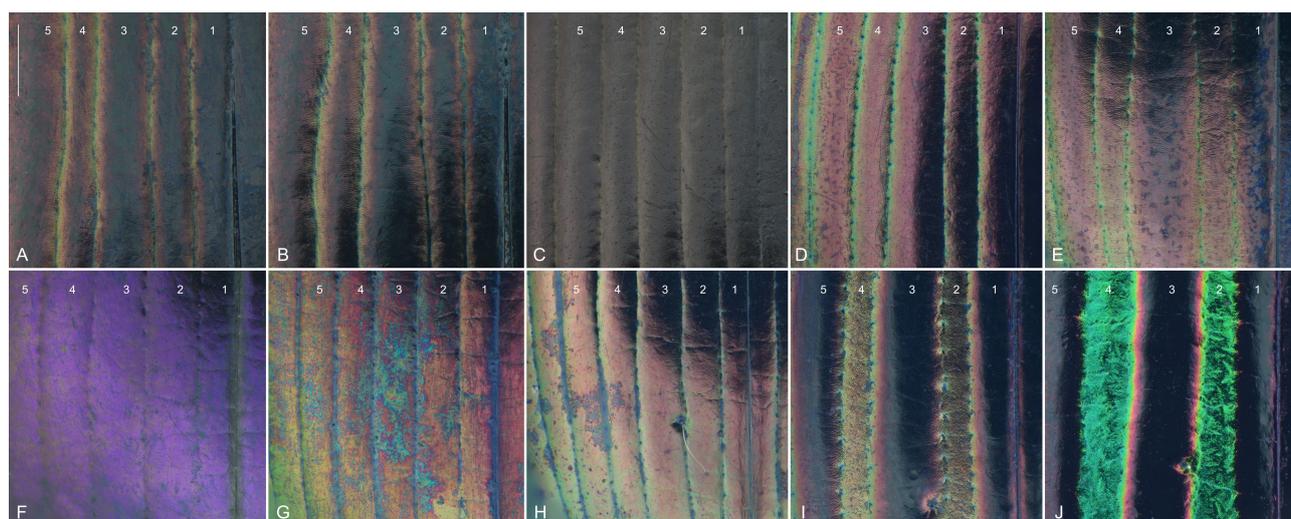


**FIGURE 3.** The angle of basal elytral margin connected with lateral elytral margin (indicated by arrow): rounded in fig. A, B; angulate in fig. C, D. **A.** *Medogia mirabilis* sp. nov. **B.** *Trigonognatha becvari* Sciaky. **C.** *Aristochroa mosuo* Tian. **D.** *Trigonognatha latibasis* Sciaky & Wrase. Scale bars = 0.5 mm; **a** for fig. A, C, D; **b** for fig. B.

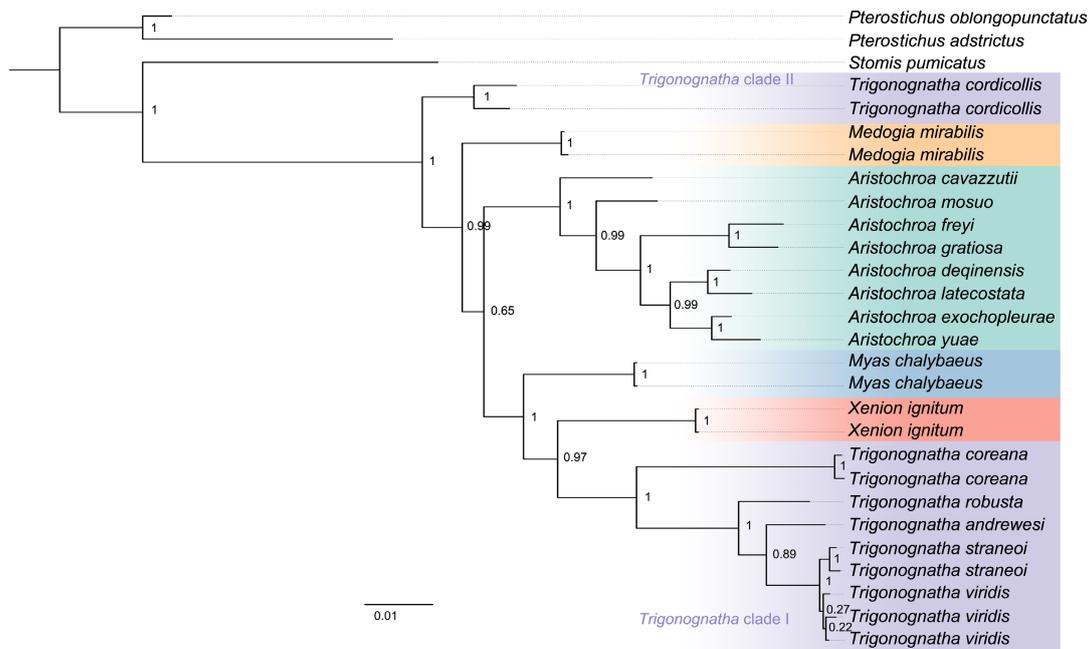
**Diagnosis.** Dorsum distinctly metallic, usually coppery green on head and pronotum, coppery purple on elytra; frons with fine wrinkles between frontal impressions; mentum tooth strongly elevated, apex deeply emarginate, marginal ridge simple at middle (Fig. 2A); odd interval of elytra distinctly wider than even ones, third interval 1.5–2.0 times as wide as fourth interval near middle portion of elytra (Fig. 4A, B); interval 7 with two setigerous pores near apex; apical portion of aedeagus strongly bent to right side, apical lamella rounded-quadrangle, with denticle on right side of apical margin.

**Description.** Body length 11.8–13.7 mm; dorsum with distinct metallic luster; head and pronotum coppery green or coppery purple with greenish hue on lateral areas; elytra coppery purple; mouthparts, antennae and legs dark brown to black, with faint metallic luster; ventral surface dark brown. Head and pronotum with indistinct fine microsculpture; elytra with distinct isodiametric microsculpture, similar on all intervals. *Head.* Frontal impressions deep and long, laterally flexed, extending behind midpoint of eyes, deeply concave aside their posterior ends; frons convex between frontal impressions, finely wrinkled, with fine punctures. Glossal sclerite with four to six setae on anterior margin, lateral setae about half length of median pair. Mentum tooth narrow, apex distinctly bifid;

apical marginal ridge of mentum nearly straight at middle, forming distinct border near base of mentum tooth; mentum tooth sharply declined anterior to marginal ridge, lateral margin of mentum tooth strongly elevated (Fig. 2A). *Pronotum*. Pronotum much wider than width of head and pronotal length, PW/HW = 1.38–1.43, PW/PL = 1.23–1.35; pronotum cordate, strongly constricted to base, posterior margin subequal to width of head, PBW/HW = 0.97–1.01. Lateral margins fully rounded near middle, strongly sinuate before posterior angles; posterior angles right-angled, not denticulate; anterior angles widely rounded. Disc finely wrinkled aside median line. Basal foveae composed of two well-defined deep sulci, inner sulcus about one-third length of pronotum, basal half gently oblique to lateral sides; outer sulcus straight, a little shallower than inner sulcus, parallel to lateral margin, slightly shorter than inner sulcus; deep basal sulcus connecting base of inner and outer sulci base, intersulcate area strongly carinate; basal foveal area without punctures or wrinkles. *Elytra*. Elytra oblong, narrow at humeral region, slightly dilated to apex, widest near apical third, much wider than pronotum, EW/PW = 1.31–1.38. Intervals convex, odd intervals usually slightly more convex than even ones; intervals 3, 5, 7 wider than adjacent intervals; third interval 1.5–2.0 times as wide as fourth interval near middle portion of elytra (Fig. 4A, B). Striae fine, faintly punctate; third interval normally without discal setigerous pore, in one paratype, left elytron with one pore near apical third, adjacent to second stria; seventh interval with two setigerous pores near apex; umbilicate series on interval 9 sparser at middle, composed of 18–20 pores. *Venter and Legs*. Proepisternum and metaepisternum impunctate; abdominal sternites finely wrinkled on lateral sides. Outer surface of metatarsomere 1 weakly carinate in males, glabrous in females. *Male genitalia*. Median lobe of aedeagus (Fig. 6B, C, D) relatively slender, curved near basal two-fifth; apical orifice dorsal, aedeagus not dilated near apical orifice; apical portion strongly inclined to right side from middle of apical orifice; apical lamella thin in lateral view, apex slightly bent ventrally, rounded-quadrate in dorsal view, slightly shorter than basal width, apical margin with sharp dorsal denticle on right side. Endophallus (Fig. 7A, B, C, D) short and straight, placed on dorso-apical side of aedeagus, gonopore opened to dorso-apical direction of aedeagus, gonopore lobe large; with two basal lobes and three apical lobes: basal lobe 1 (bl-1) near central of apical orifice, small and flat, finely scaled; basal lobe 2 (bl-2) near apical lamella, strongly swollen with wide and truncate apex, distinctly pigmented and scaled; apical lobe 1 (al-1) on right side of endophallus, large and globular, finely scaled; apical lobe 2 (al-2) on left side of endophallus, of similar shape to al-1; apical lobe 3 (al-3) strongly swollen, apex of irregular shape, distinctly pigmented and scaled. *Female reproductive system*. Gonocoxite II (Fig. 7G) stout, apex widely rounded, without any ensiform seta or nematiform seta. Female sternite VIII (Fig. 7F) strongly transverse, composed of one pair of hemisternites; hemisternite subquadrate, anterior margin subequal to posterior margin; medial membranous area narrow and oblique, more than half width of hemisternite; apical membranous area large. Spermatheca straight, undifferentiated, coiled twice at apical third, terminally acuminate; spermathecal gland about twice length of spermatheca, tubular, gradually dilated to apex, inserted in basal third of spermatheca (Fig. 7E).



**FIGURE 4.** Elytral inner five intervals on median-posterior region. **A.** *Medogia mirabilis* sp. nov. **B.** *Medogia mirabilis* sp. nov. **C.** *Medogia melanaria* sp. nov. **D.** *Aristochroa mosuo* Tian. **E.** *Aristochroa mosuo* Tian. **F.** *Myas chalybaeus* (Palliard). **G.** *Xenion ignitum* (Kraatz). **H.** *Trigonognatha cordicollis* Sciaky & Wrase. **I.** *Aristochroa latecostata* (Fairmaire). **J.** *Aristochroa perelegans* Tschitschérine. Scale bar = 0.5 mm.



**FIGURE 5.** Bayesian analysis conducted for the combined molecular dataset of gene COI and gene 28S. Numbers above each node indicate Bayesian posterior probabilities (PP) values.

**Distribution.** The new species is endemic to Mêdog County, Xizang; only known from the southern slope of Gangri Gabu Mountain, southern to Galungla pass. Altitude of the confirmed collecting sites is between 2,000–3,040 m (Fig. 11).

***Medogia melanaria* Shi & Wang sp. nov.**  
(Figs 1B, 2B, 4C, 8)

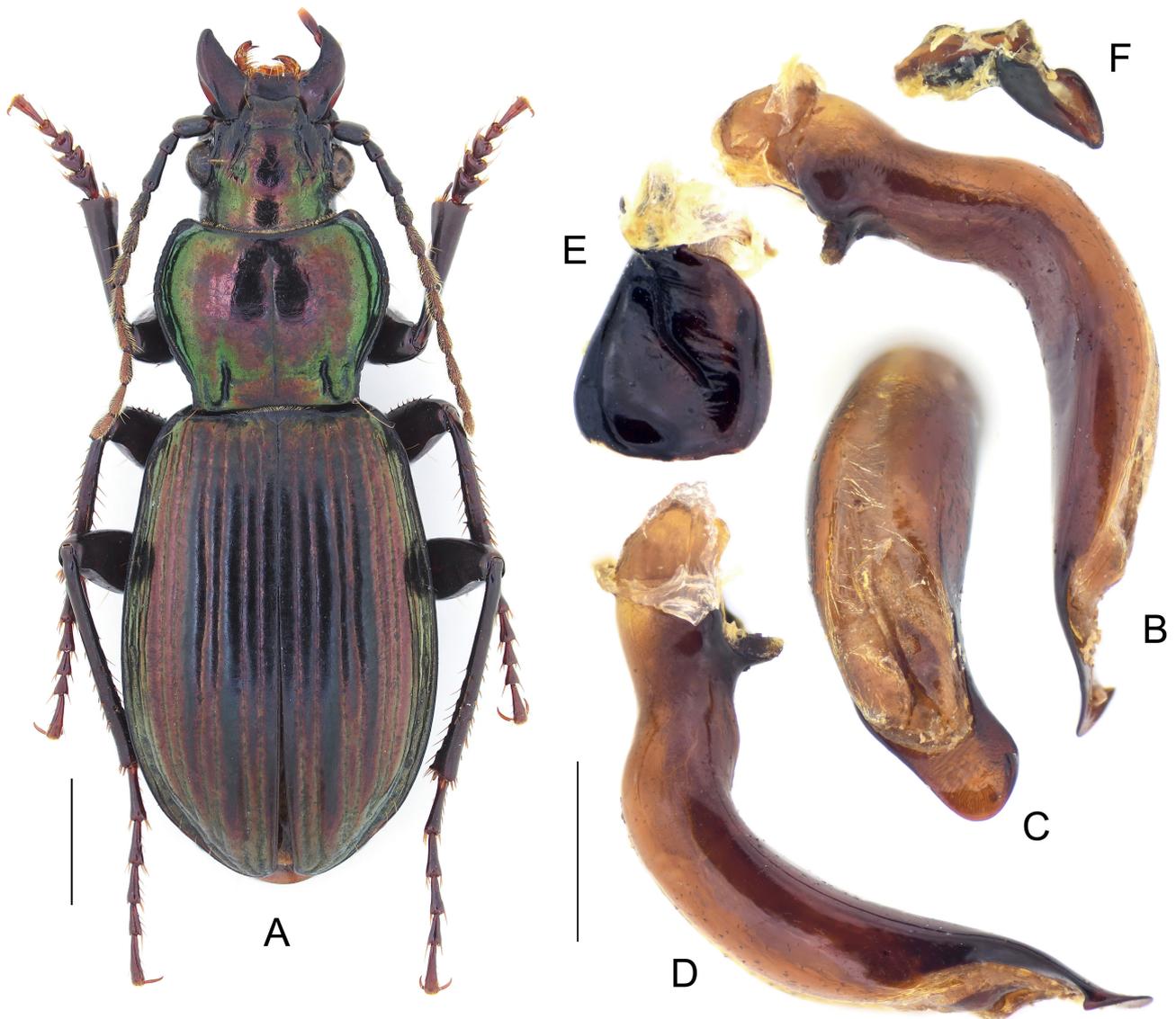
**Type material. HOLOTYPE: CHINA:** male (IZCAS), “China, Tibet, Mêdog Co., Baibung Town, Lage, under rocks, 29.46929, 95.00130”, “3270 m, 2011.7.26 D, Liu Ye Collector, Institute of Zoology”. **PARATYPE: CHINA:** 1 male (IZCAS), “Xizang, Mêdog County, Hanmi, 2000 m, 2011.VII.29, Yang Xiao-Dong leg., B11y2335” [in Chinese].

**Etymology.** The species name “*melanaria*” is derived from the Greek adjective “melas” (black) and the Latin “aria” (of correlating to), referring to the black body coloration in new species, which is uncommon among related genera to *Medogia* (*Myas* complex).

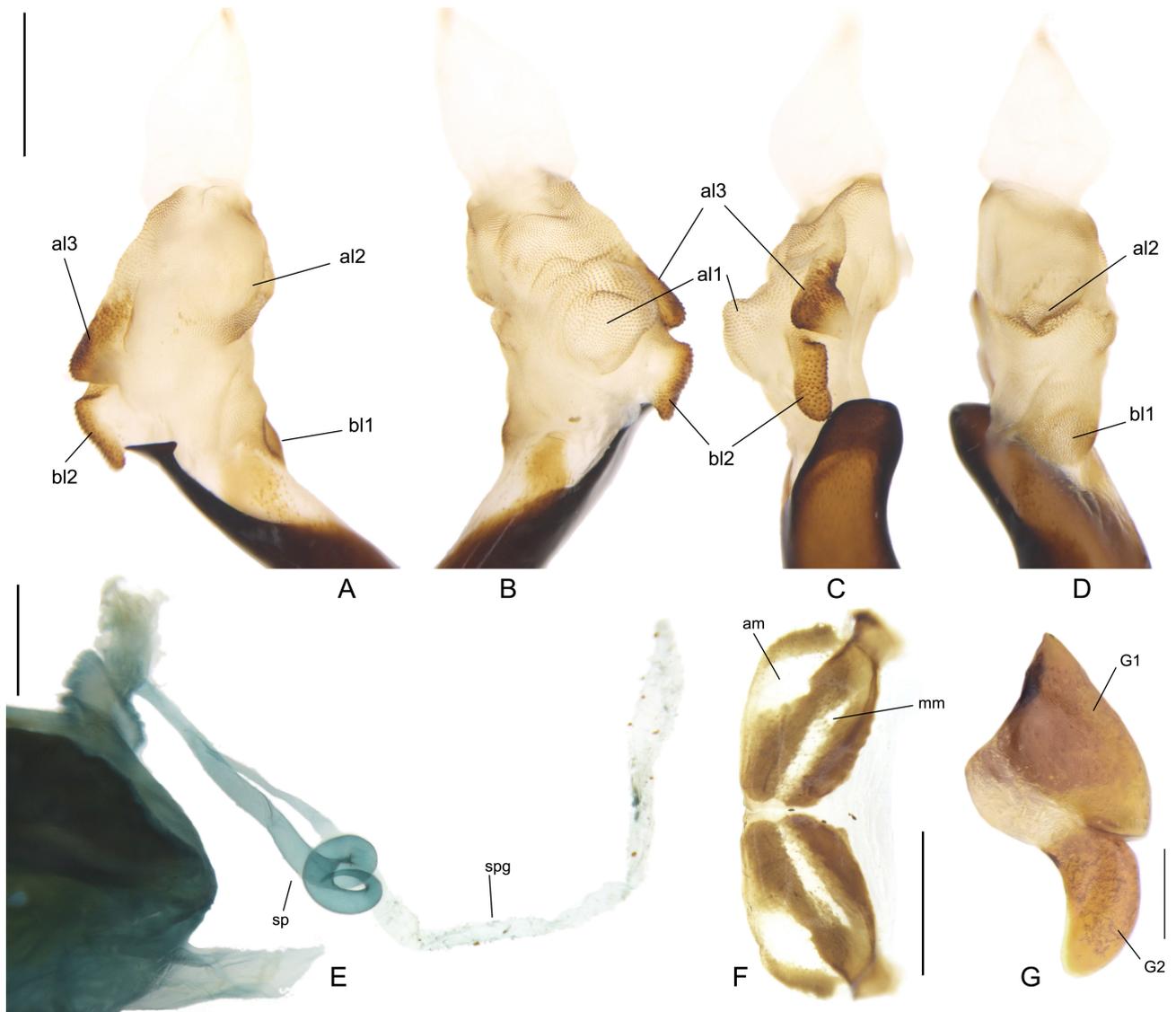
**Diagnosis.** Dorsum entirely black, non-metallic; frons with distinctly longitudinal wrinkles between frontal impressions; mentum tooth strongly elevated, marginal ridge forming triangular ridge at middle of mentum tooth (Fig. 2B); elytra odd interval slightly wider than even ones, third interval 1.1–1.2 times as wide as fourth interval near middle portion of elytra (Fig. 4C); interval 7 with one setigerous pore near apex; apical portion of aedeagus weakly bent to right side, apical lamella triangular, apex bent downwardly, without denticle.

**Description.** Body length 12.2–13.1 mm; dorsum entirely black, without metallic luster; mouthparts, antennae and legs dark brown to black; ventral surface dark brown. Head and pronotum with indistinct fine microsculpture; elytra with distinct isodiametric microsculpture, similar on all intervals. *Head.* Frontal impressions deep and long, laterally curved, extending behind midpoint of eyes, with longitudinal depressions adjacent to their posterior ends; frons convex between frontal impressions, with coarse longitudinal wrinkles, with minute punctures. Glossal sclerite with four setae on anterior margin, lateral setae about one-fourth length of median pair. Mentum tooth narrow, strongly elevated on base of mentum tooth, apex nearly truncate; apical marginal ridge of mentum strongly projected anteriorly at middle, forming sharp triangular ridge on middle of mentum tooth, lateral sides of mentum tooth declined (Fig. 2B). *Pronotum.* Pronotum much wider than width of head and pronotal length, PW/HW = 1.37–1.42, PW/PL = 1.27–1.33; pronotum cordate, strongly constricted to base, posterior margin subequal to width

of head, PBW/HW = 0.96. Lateral margins fully rounded near middle, strongly sinuate before posterior angles; posterior angles right-angled, not denticulate; anterior angles widely rounded. Disc distinctly wrinkled aside median line. Basal foveae composed of two well-defined deep sulci, inner sulcus about one-third length of pronotum, basal half gently oblique to lateral sides; outer sulcus gently sinuate, in similar depth as inner sulcus, parallel to lateral margin, slightly shorter than inner sulcus; fine basal sulcus connecting base of inner and outer sulci base, intersulcate area weakly convex; basal foveal area impunctate, distinctly wrinkled except basal-median region of pronotum. *Elytra*. Elytra oblong, narrow at humeral region, slightly dilated to apex, widest near apical third, much wider than pronotum, EW/PW = 1.23–1.32. Intervals shallowly convex, odd intervals not more convex than even ones; intervals 3, 5, 7 only slightly wider than adjacent intervals; third interval 1.1–1.2 times as wide as fourth interval near middle portion of elytra (Fig. 4C). Striae fine, faintly punctate; third interval without discal setigerous pore; seventh interval with one setigerous pore near apex; umbilicate series on interval 9 sparser at middle, comprising 16–19 pores. *Venter and Legs*. Proepisternum and metaepisternum with fine punctures; abdominal sternite finely wrinkled on lateral sides. Outer surface of metatarsomere 1 not carinate in males. *Male genitalia*. Median lobe of aedeagus relatively slender (Fig. 8B, C), curved near basal two-fifth; apical orifice dorsal, aedeagus not dilated near apical orifice; apical portion weakly inclined to right side from middle of apical orifice; apical lamella thin in lateral view, apex distinctly bent ventrally, subtriangular in dorsal view, length subequal to basal width, apical margin without denticle. Endophallus not studied. Females unknown.



**FIGURE 6.** Habitus and male genitalia of *Medogia mirabilis* sp. nov. **A.** habitus, holotype. **B–F.** male genitalia, holotype. **B.** median lobe, left lateral view. **C.** median lobe, dorsal view. **D.** median lobe, right lateral view. **E.** left paramere. **F.** right paramere. Scale bars = 2.0 mm for fig. A; = 1.0 mm for fig. B, C, D, E, F.



**FIGURE 7.** Male and female genitalia of *Medogia mirabilis* sp. nov. **A–D.** Endophallus of median lobe of aedeagus, **A.** left-lateral view. **B.** right-lateral view. **C.** ventral view. **D.** dorsal view. **E.** Female internal reproductive tracts. **F.** Female sternite VIII. **G.** Gonocoxite II of ovipositor. Scale bars = 1.0 mm for fig. A, B, C, D, F; = 0.5 mm for fig. E; = 0.2 mm for fig. G. Abbreviations: **bl**—basal lobe of endophallus, **al**—apical lobe of endophallus, **sp**—spermatheca, **spg**—spermathecal gland, **mm**—medial membranous area, **am**—apical membranous area, **G1**—gonocoxite I, **G2**—gonocoxite II.

**Distribution.** The new species is endemic to Mêdog County, Xizang; only known from the southern slope of Namcha Barwa Mountain, east of Duoxiongla pass. Altitude of the confirmed collecting sites is 3,270 m (Fig. 11).

**Taxonomic comments.** The general habitus and male genitalia of the new species differ from those of the type species of *Medogia*. Nevertheless, due to the similarity in several key diagnostic characters outlined in the taxonomic key, the new species is herein assigned to *Medogia* gen. nov. Additionally, the morphological differences between the two known species of *Medogia* are noted in the diagnosis sections.

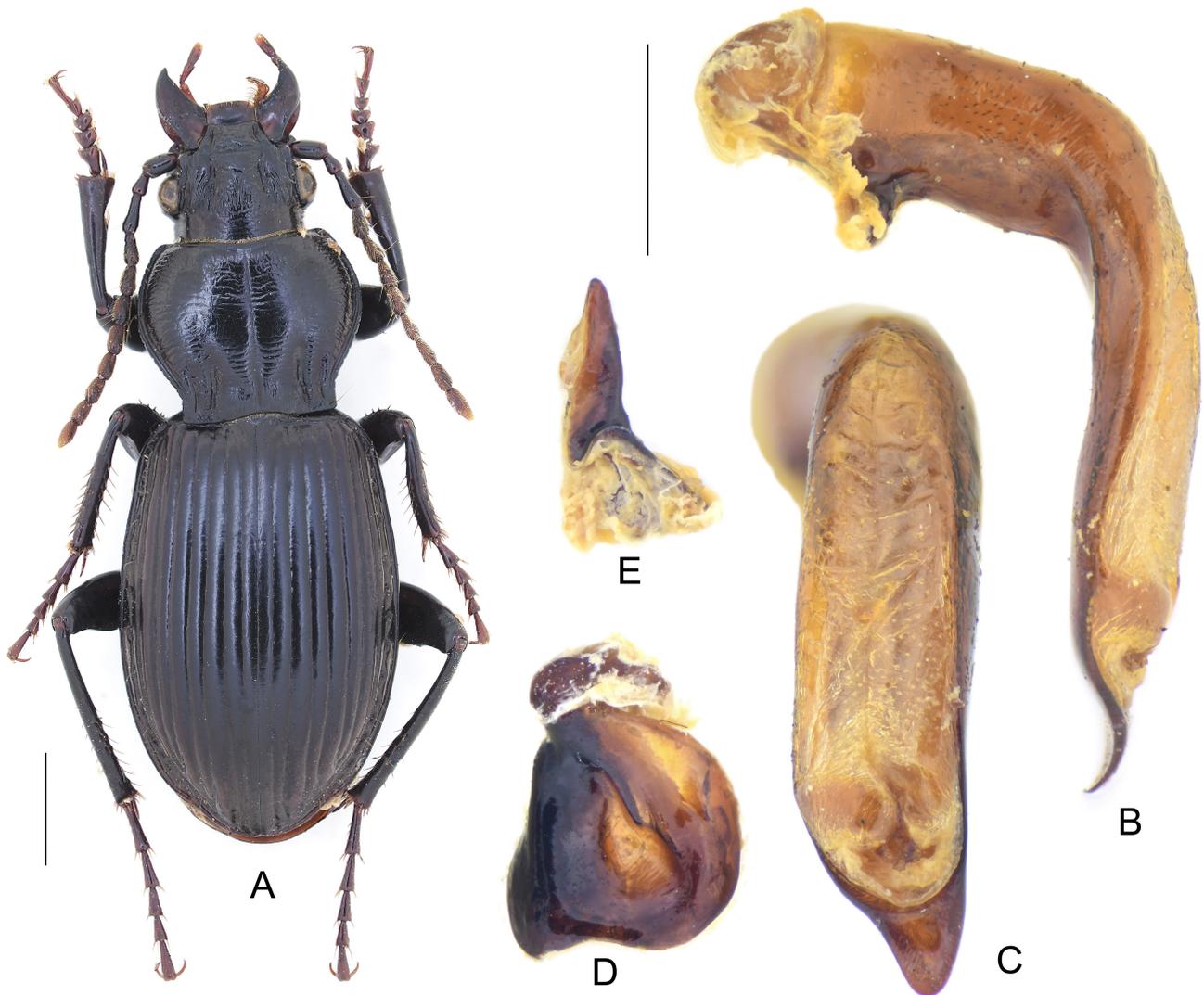
***Pterostichus (Circinatus) medogensis* Shi & Wang sp. nov.**  
(Fig. 9)

**Type material. HOLOTYPE: CHINA:** male (IZCAS), “CHINA, Xizang, Mêdog county, 62 km at road Bomê to Mêdog, mixed forest, 2794 m, N29.70937 E95.59230”, “2012.VII.27, by pitfall trap, LIANG Hongbin, SHI

Hongliang, LIU Ye, WANG Yanan leg., Institute of Zoology, CAS". **PARATYPES: CHINA:** (a total of 2 males and 4 females): 1 male (IZCAS), same data as holotype. 1 male (IZCAS), "China, Tibet, Mêdog, 56 km on Mêdog Rd., by pitfall trap, 29.71644, 95.61029", "3040 m, 2020.9.16 D1, Liang H.B., Xu Yuan, Institute of Zoology". 1 female (IZCAS), "China, Tibet, Mêdog, 61 km on Mêdog Rd, Near Xirong valley"; "29.71299, 95.59807, 2809 m, 2019.7.24N, Xu Yuan, handpick". 1 female (IZCAS), "China, Tibet, Mêdog, Zha-Mo road 37k (new), pitfall trap, N29.7143, E95.6036, 2950 m, 2015.8.31 D2, Liang H.B. coll. IOZCAS". 1 female (IZCAS), "China, Tibet, Mêdog, 63 km of Mêdog Rd. by hand; 29.70563, 95.57299, 2724 m, 2017.8.16 D, Liang Hongbin coll.". 1 female (IZCAS), "China, Tibet, Mêdog, Zha-Mo road 62K (new 44K), light trap, N29.7086, E95.5775; 2787 m, 2015.8.30N, Liang H.B. coll. IOZ".

**Etymology.** The species name is derived from its type locality, Mêdog County in southeastern Xizang, China.

**Diagnosis.** The new species is distinguishable within subgenus *Circinatus* by: body form elongate, lateral sides subparallel; pronotum subquadrate, with posterior angles narrowly rounded-rectangular and one or two mid-lateral setae; elytra with distinct isodiametric microsculpture in both sexes; humeral tooth very distinct; parascutellar striae present; third interval with two setigerous pores; male sternite VII with large and shallow concavity at middle; apical orifice of aedeagus slightly bent to left side, from small notch on left side of ventral surface; apical lamella about twice length of basal width, apex rounded.



**FIGURE 8.** Habitus and male genitalia of *Medogia melanaria* sp. nov. **A.** habitus, paratype. **B–E.** male genitalia, holotype. **B.** median lobe, left lateral view. **C.** median lobe, dorsal view. **D.** left paramere. **E.** right paramere. Scale bars = 2.0 mm for fig. A; = 1.0 mm for fig. B, C, D, E.

**Description.** Body length 10.7–11.6 mm; dorsum entirely black, without metallic luster; mouthparts, antennae and tarsi dark brown; ventral surface nearly black. Head and pronotum with distinct microsculpture, isodiametric on head, slightly transverse on pronotum; elytra with isodiametric microsculpture, similar in both sexes, shallower and coarser than that on head and pronotum. *Head.* Frontal impressions very shallow, hardly impressed behind frontoclypeal sulcus; frons glabrous, with faint wrinkles. Eyes large and convex, but not fully hemisphere; tempora slightly swollen behind eyes, about half length of eyes. Antennae reaching elytra basal eighth; antennomere 4 pubescent except basal fifth. Mentum deeply concave aside middle of basal margin; mentum tooth narrow, apex bifid; submentum with two setae on each side. *Pronotum.* Pronotum much wider than width of head, PW/HW = 1.52–1.59; pronotum nearly quadrate, widest near anterior third, slightly wider than length, PW/PL = 1.09–1.14; slightly constricted to base, PW/PBW = 1.18–1.23. Lateral margins weakly arched near middle, straightly and slightly narrowed to posterior angles, lateral margins hardly sinuate before posterior angles; posterior angles right-angled, not denticulate, apex narrowly rounded; posterior margin straight; anterior angles slightly pointed. Lateral bead equally narrow, obsolete near posterior angles; basal bead sinuate near inner sulcus of basal foveae, obsolete at middle; lateral sides with one or two mid-lateral setae before widest point; posterior lateral seta a little distant from posterior angles, distance from seta to posterior margin of pronotum about twice its distance to lateral margin. Median line fine and entire, disc with faint wrinkles aside median line. Basal foveae shallow, without punctures or wrinkles; outer sulcus obsolete, only weakly indicated on its anterior end; inner sulcus shallow but distinct, without well-defined boundaries, nearly straight, about one-third length of pronotum; basal foveal area nearly flat between inner sulcus and lateral margin. *Elytra.* Elytra oblong, slightly narrowed at humeral region, lateral sides subparallel, widest near apical two-fifth, slightly wider than pronotum, EW/PW = 1.16–1.27; basal border entire and straight; humeral tooth large, pointed laterally; lateral border slightly rolling up. Striae finely impressed, impunctate; parascutellar striae long, apices free. Intervals shallowly convex; parascutellar pore present; third interval with two setigerous pores, anterior one a little before middle, posterior one near apical fourth, both adjacent to second stria, in one paratype, posterior seta absent on one elytron; seventh interval with two setigerous pores near apex; umbilicate series on interval 9 sparser at middle, comprising 14–15 pores (6, 1, 7–8). *Venter and Legs.* Proepisternum and metepisternum impunctate; abdominal sternite VII modified in males (Fig. 9H), with large and shallow concavity at middle, faint median longitudinal ridge present in concavity. Protibia with two spines on outer apical angles; in males, ventroapical tubercle (*vat*, Fig. 9F) strongly projected forming large tooth, apex bifid, projection smaller in females, stout ventroapical spine (*vas*, Fig. 9G) inserted on it; apical ctenidium restricted inner to ventroapical tubercle; ridge between ventroapical tubercle and insertion of clip spur only indicated at basal half, obsolete behind tubercle. Mesotrochanter with one seta; mesofemora with one ventral-apical spine; metatrochanter with one seta; metafemora with two setae; metatarsomeres one to two distinctly ridged on outer surface, metatarsomere 3 with very faint ridge on outer surface; tarsomere 5 glabrous ventrally. *Male genitalia.* Median lobe of aedeagus relatively stout (Fig. 9B, C, D), gradually curved near basal two-fifth, apical portion distinctly bent downwardly; apical orifice dorsal, slightly bent to left side, emerging from small notch on left side of ventral surface; apical lamella thin in lateral view, apex oriented to ventral-apical side of aedeagus; apical lamella oblong when in dorsal view, placed on right side of aedeagus, about twice length of basal width, apex rounded, slightly dilated. Right paramere short and straight (Fig. 9E). Endophallus not studied. *Female genitalia.* Female ovipositor with gonocoxite II slender and falciform, apex narrow, outer margin with two ensiform setae near middle and basal fourth, inner margin with one ensiform seta near middle.

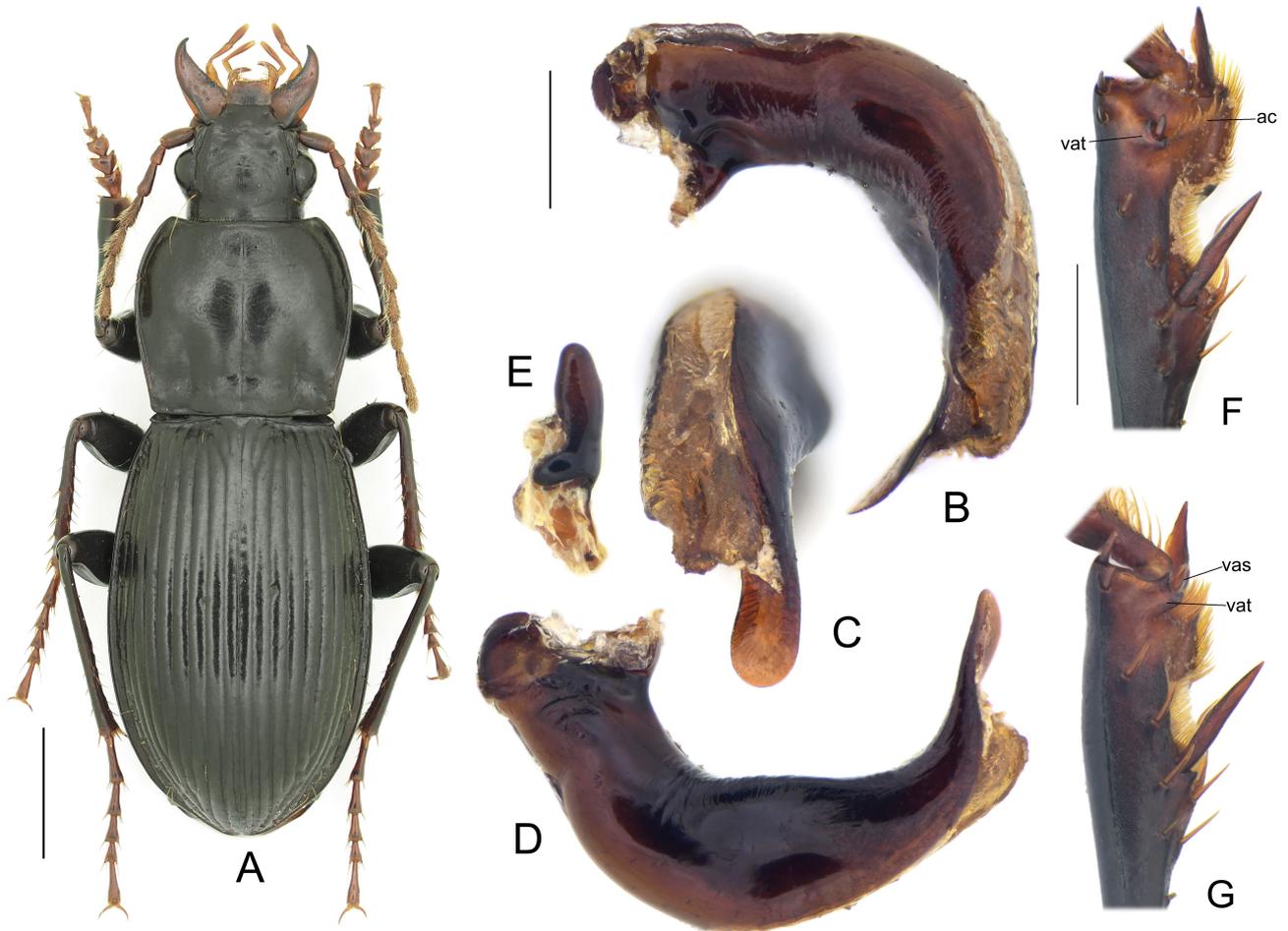
**Distribution.** The new species is endemic to Mèdog County, Xizang. It is only known from the southern slope of Gangri Gabu Mountain, south of Galungla pass. Altitude of the confirmed collecting sites is between 2,724–3,040 m (Fig. 12).

**Taxonomic comments.** The present new species can be assigned to the subgenus *Circinatus* based on the following diagnostic characters: pronotal basal foveae without outer sulci; pronotal posterior seta a little distant from the posterior angle; lateral sides of pronotum relatively narrow; ventroapical tubercle of protibiae strongly projected, with one ventroapical spine inserted on it (Fig. 9F, G); apical orifice of aedeagus emerging from small notch on the left side of ventral surface.

In most Chinese subgenera of *Pterostichus*, the ventroapical tubercle of protibiae is flat or very shallowly pointed. By contrast, in certain species of the subgenus *Circinatus* (e.g. *P. pohnerti* Jedlička, 1934, *P. liciniiformis* Csiki, 1930, *P. wangjiani* Shi & Liang, 2015), this tubercle projects to form distinct tooth at least in males. Thus, the similarities in protibial structure further support assigning *P. medogensis* **sp. nov.** to subgenus *Circinatus*, although its

ventroapical tubercle is more strongly projected than in related species. Outside *Circinatus*, the ventroapical tubercle is also distinctly projected in some species of the subgenera *Orientostichus* Sciaky & Allegro, 2013, *Pseudethira* Sciaky, 1996, *Steropanus* Fairmaire, 1888, and *Wraseiellus* Shi & Sciaky, 2013. These subgenera can be readily distinguished from *Circinatus* by their more robust body form and the absence of seta on metatrochanter.

The subgenus *Circinatus* Sciaky comprises thirty species, which are distributed in southern China and Vietnam (Shi & Liang 2015; Fedorenko 2019; Fedorenko 2023). The present new species differs from most of its consubgeneric species by its nearly quadrate pronotum with distinct posterior angles. Given the unique shape of its pronotum, the new species is only comparable to three species, namely *P. wangjiani*, *P. caobang* Fedorenko, 2019, and *P. tonkinensis* Straneo, 1980. Among these three, *P. wangjiani* from Yunnan is more similar to *P. medogensis* **sp. nov.** In contrast, the other two species, both from Vietnam, differ from the aforementioned two taxa by the following characteristics: elytra with very faint linear microsculpture; elytral parascutellar stria absent; elytral third interval with only one setigerous pore.



**FIGURE 9.** Habitus and male genitalia of *Pterostichus (Circinatus) medogensis* **sp. nov.** **A.** habitus, paratype. **B–E.** male genitalia, holotype. **B.** median lobe, left lateral view. **C.** median lobe, dorsal view. **D.** median lobe, right lateral view. **E.** right paramere. **F.** right protibia, ventral view. **G.** right protibia, ventral-lateral view. **H.** male abdominal sternite VII. Scale bars = 2.0 mm for fig. A; = 0.5 mm for fig. B, C, D, E, F, G, H. Abbreviations: **vat**—ventroapical tubercle, **vas**—ventroapical spine, **ac**—apical ctenidium.

Compared with *P. wangjiani*, *P. medogensis* **sp. nov.** exhibits the following important differences: pronotum lateral margins less curved near middle; elytra with prominent humeral tooth; male sternite VII more shallowly concave; apical lamella of aedeagus much longer.

*Pterostichus medogensis* **sp. nov.** is the only known species of the subgenus *Circinatus* in the Xizang Autonomous Region and outlines the westernmost distribution border of this subgenus. The Himalayan fauna of *Pterostichus* is primarily composed of several endemic species belonging to the subgenus *Pseudethira* and two highly widespread

species of the subgenus *Bothriopterus* Chaudoir, 1835. The discovery of the present new species, together with *P. hemichlorus* Chen *et al.*, 2024 belonging to subgenus *Wraseiellus*, is unexpected. This is because all other members of these two subgenera are distributed in the Hengduan Mountains or regions further east. Future surveys in southern Xizang are expected to discover additional new *Pterostichus* species that are rare and relictual.

## Records of Pterostichini from Mêdog County

In addition to the three new species described in this study, five other Pterostichini species are distributed in Mêdog County, Xizang. Three of these species have been previously recorded in Mêdog, while the remaining two are newly recorded for this region herein. Among the eight Pterostichini species in Mêdog, three exhibit well-developed hind wings and have extremely wide distribution ranges. By contrast, the other five species possess reduced hind wings and are only known from single or a few localities in Mêdog.

### *Trigonotoma indica* Brullé, 1834

Brullé 1834: 333 (type locality: Bengal); Zhu *et al.* 2020: 57 (recorded to China [Mêdog]). Bouchard *et al.* 2024: 543 (fixed as type species of genus *Trigonotoma*).  
*viridicollis* Dejean, 1828: 183 (original: *Trigonotoma*; type in MNHN; type locality: India or.). Unavailable name, misidentified of *Omaseus viridicollis* Macleay, 1825.  
*baehri* Kirschenhofer, 1997: 700 (original: *Trigonotoma*; type in ZSM; type locality: C-Indien, MPR. Panna, Nat. Park). Dubault, Lassalle & Roux 2008: 181 (synonymization established).

**Examined specimens from Mêdog County.** 1 female (IZCAS), “Xizang, Mêdog township, light trap, 2016.8.5 Qiu Tengfei leg.”. 1 female (IZCAS), “Xizang, Mêdog, Baibung, 700 m, 2011.VIII.09, Yang Xiaodong leg.”. 1 male (IZCAS), “Xizang, Mêdog, Baibung, 780 m, Bi Wenxuan leg., 2011.VIII.10-13”. 1 male (IZCAS), “China, Tibet, Mêdog 5 km NE Baibung, Jiagagou bridge, N29.2508, E95.1992; 790 m, 2016.6.18N, Liang Hongbin coll”.

**Remarks.** This species is very widely distributed in South Asia, including India, Bangladesh, Sri Lanka, Nepal and Pakistan. In China, it is only known from a few of localities in the low elevation (below 1,000 m) of Mêdog County (Fig. 11). Illustrations of its habitus and male genitalia were provided by Zhu *et al.* (2020).

### *Lesticus bii* Zhu, Shi & Liang, 2018

Zhu *et al.* 2018: 137 (type locality: Mêdog).

**Examined specimens from Mêdog County.** Detailed information of type series has been provided in Zhu *et al.* (2018); 1 male and 2 females (IZCAS), “China, Tibet, Mêdog, Baibung, Deergong. By pitfall trap, site 1”, “29.17785, 95.14089, 1676.55 m, 2024.7.22, N1, Liang Hongbin, Institute of Zoology, CAS”; 2 females, same data but 2024.7.24; 2 females (IZCAS), “China, Tibet, Mêdog, Baibung, Deergong. By pitfall trap, site 3”, “29.18283, 95.14799, 1666.78 m, 2024.7.24, N3, Liang Hongbin, Institute of Zoology, CAS”.

**Remarks.** This is a rare and endemic species in Mêdog, only known from a few localities in the mid-low elevation (1,500–1,900 m) along the Yarlung Zangbo Canyon (Fig. 11). Illustrations of habitus and male genitalia have been provided by Zhu *et al.* (2018).

### *Nirmala odelli* Andrewes, 1930 (new record for Xizang)

Andrewes 1930: 30 (type locality: Sikkim); Yu 1992: 476 (recorded to China [Yunnan]).

**Examined specimens from Mêdog County.** 7 exx. (IZCAS), “Xizang, Mêdog, 61 km on Mêdog Rd., near Xirong valley”; “29.71299, 95.59807, 2809 m, 2019.7.24N Xu Yuan, handpick”. 6 exx. (IZCAS), “China, Tibet, Mêdog, 61 km from Bomi to Mêdog, under rocks, 29.70376N, 95.56912E, 2765 m, 2006.8.26 day., Liang H.B. collector”. 42

exx. (IZCAS), “China, Tibet, Mêdog, 62 km on Mêdog road, roadside, 29.70573, 95.57285, 2731 m, 2021.6.17N, Zhang Neng coll.”. 2 exx. (IZCAS), “Xizang, Mêdog, Bangxin, 65 km Mêdog road, 2792 m, 2021.VI.17; 29.70128N, 95.56189E, Liu Hong leg.”. 3 exx. (IZCAS), “China, Tibet, Mêdog, Mêdog road 70 km, 29.69804, 95.55492, 2663 m, 2022.7.16, Liang HB, Xu Y coll.”. 5 exx. (CBFU), “Xizang, Mêdog, 80K, 2350 m, 2016.VII-30, Lu Yanquan leg.”.

**Remarks.** This is a common species distributed from the southern slopes of the Eastern Himalaya to the middle section of the Gaoligong Mountains. In Mêdog County, it is locally abundant, but has been only recorded along the valley of Galung River, in the southern slope of Gangri Gabu Mountain, at an altitude of 2,300–3,000 m. This species can be readily recognized by its vivid color with bright green pronotum and red elytra.

***Pterostichus (Pseudethira) rugosiceps* Schmidt, 2012, new record to Mêdog County**

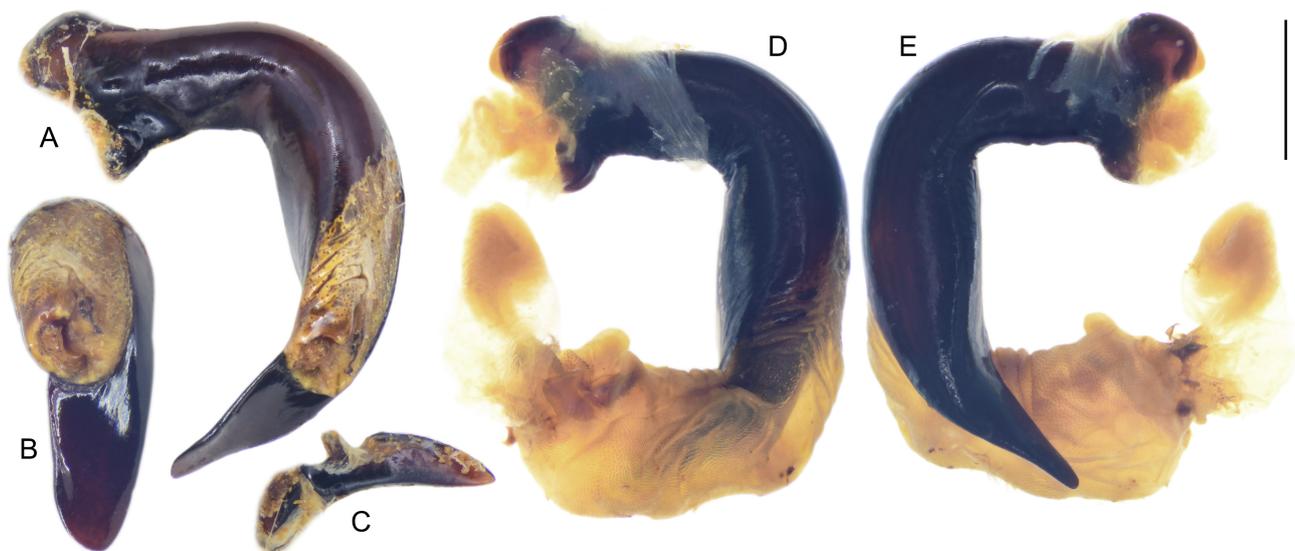
Schmidt 2012: 228. (type locality: “Tangme”, Xizang).

**Examined specimens from Mêdog County.** 1 female (IZCAS), “Xizang, Mêdog, 62K, Xirong valley”, “2019.VII.24D, 2749 m, N29.70694, E95.58835, Ma Zhuo leg.”. 1 male (IZCAS), “China, Tibet, Mêdog, 80K, N29.65793, E95.48988; 2050 m, 2016.6.15D, Liang Hongbin leg”. 1 male (CBFU), “Xizang, Mêdog, 80K, 2012.VII.20 night, Yang GY leg.”. 1 female (CBFU), “China, Xizang, Nyingchi, Mêdog county, Gelin vill., N29.2132, E95.1712, 1675 m, 2023.VIII.8, Liu YQ leg.”. 1 male (IZCAS), “China, Tibet, Mêdog, Baibung, Aniqiao, collected in leaf litter, 29.32874N, 95.17754E, 1080 m, 2005.8.17, Zhou D.K., Huang H.”. 1 female (IZCAS), “China, Tibet, Mêdog, Baibung, Laohuzui, vegetation beating, 29.35416N, 95.14866E, 1500 m, 2006.8.12, Liang H.B. collector”. 2 females (IZCAS), “Xizang, Mêdog, Hanmi, 2000 m, 2011.VII.29, Yang Xiaodong leg.”.

**Remarks.** The hind wings of this species are reduced, but it exhibits a relatively wide distribution range compared to other macropterous species in this region. It has been recorded in several localities along the valleys of the Yarlung Zangbo River system, in Mêdog and Bomê counties (Fig. 12). This species tends to inhabit forested habitats at an altitude of 1,500–2,500 m.

Within the Pterostichini from Mêdog, this species is distinguishable by its robust body form, along with head and pronotum with distinct wrinkles. It was originally described on two females only. We herein provide the first record of males, accompanied by illustrations and a description of the male genitalia.

**Description for male genitalia.** Median lobe of aedeagus stout with very large apical lamella (Fig. 10A, B), gradually curved near basal third, middle portion with straight ventral margin, apical portion strongly curved ventrally, apex oriented to ventral-apical side of aedeagus; apical orifice dorsal, slightly moved to left side; in dorsal view, apical lamella smooth on dorsal surface, apex weakly bent to right, slightly narrowed to apex, not widened



**FIGURE 10.** Male genitalia of *Pterostichus (Pseudethira) rugosiceps* Schmidt. **A.** median lobe, left lateral view. **B.** median lobe, dorsal view. **C.** right paramere. **D.** endophallus, left lateral view. **E.** endophallus, right lateral view. Scale bar = 1.0 mm.

on left or right side. Right paramere thumb-shaped (Fig. 10C). Endophallus (Fig. 10D, E) short, directed ventrally across left margin of apical lamella, gonopore opening in ventral-basal direction; surface without setose area or sclerotized pieces; three small lobes present near ventral-left side of gonopore. Male sternite VII modified, with distinct longitudinal ridge along middle; ridge gradually vanished to basal third, strengthened to apex and present as low tubercle near apical margin.

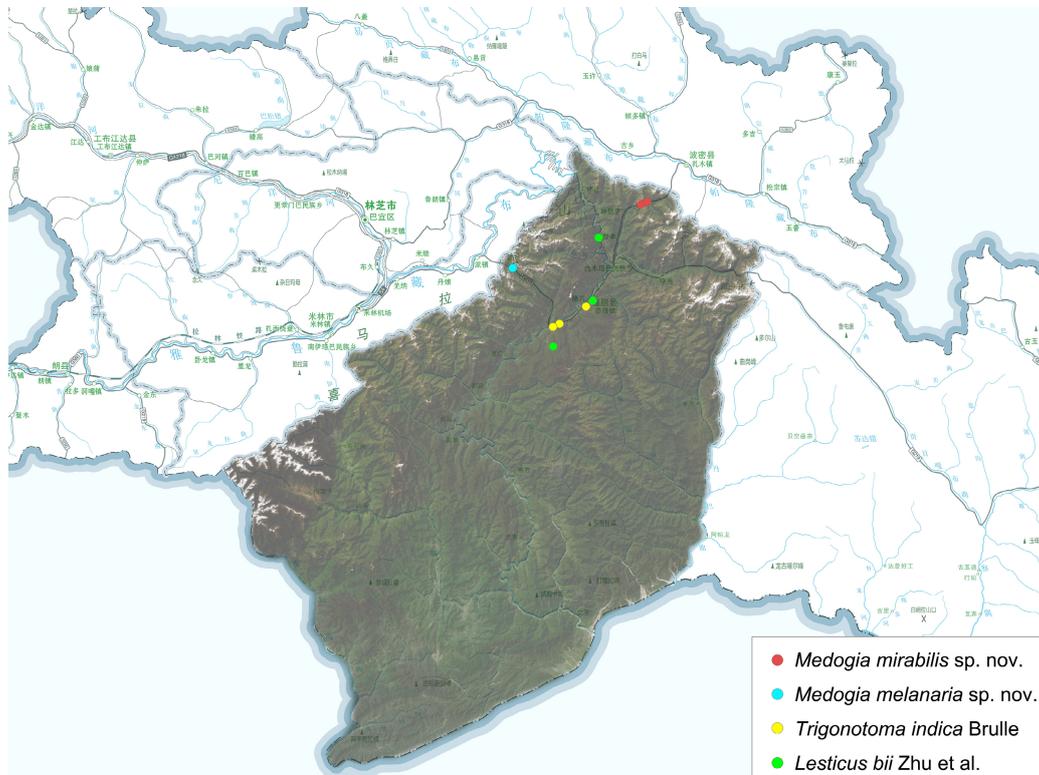


FIGURE 11. Distribution of Pterostichini species in Mêdog. All confirmed distributions from China are marked.

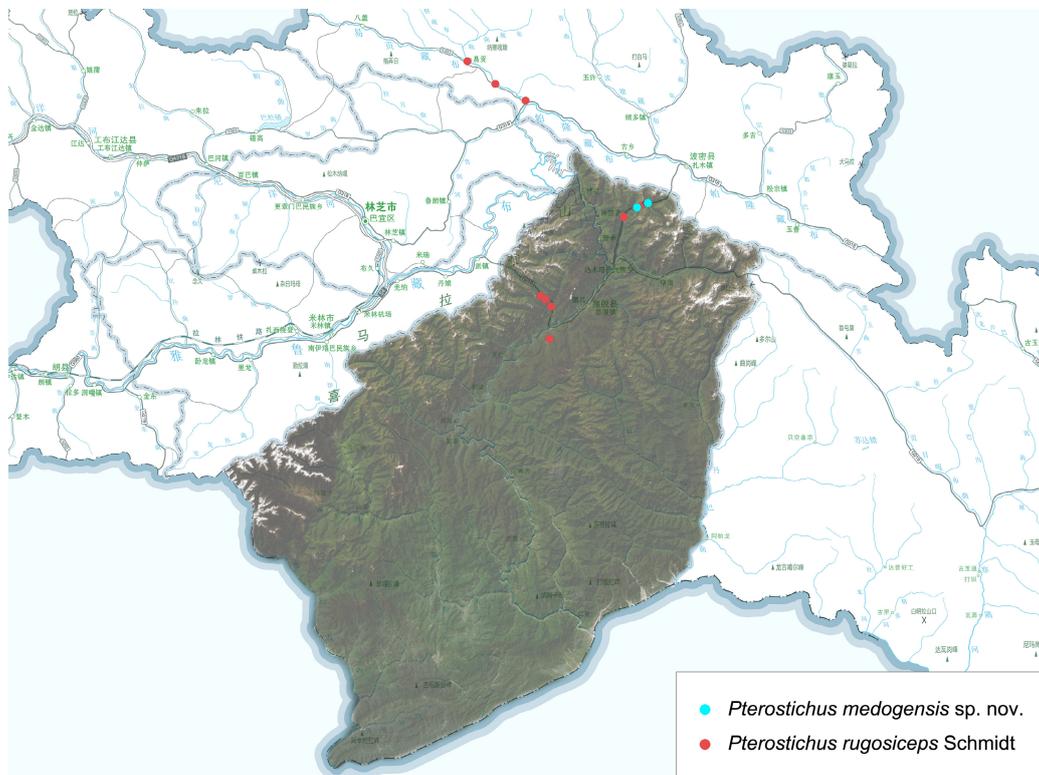
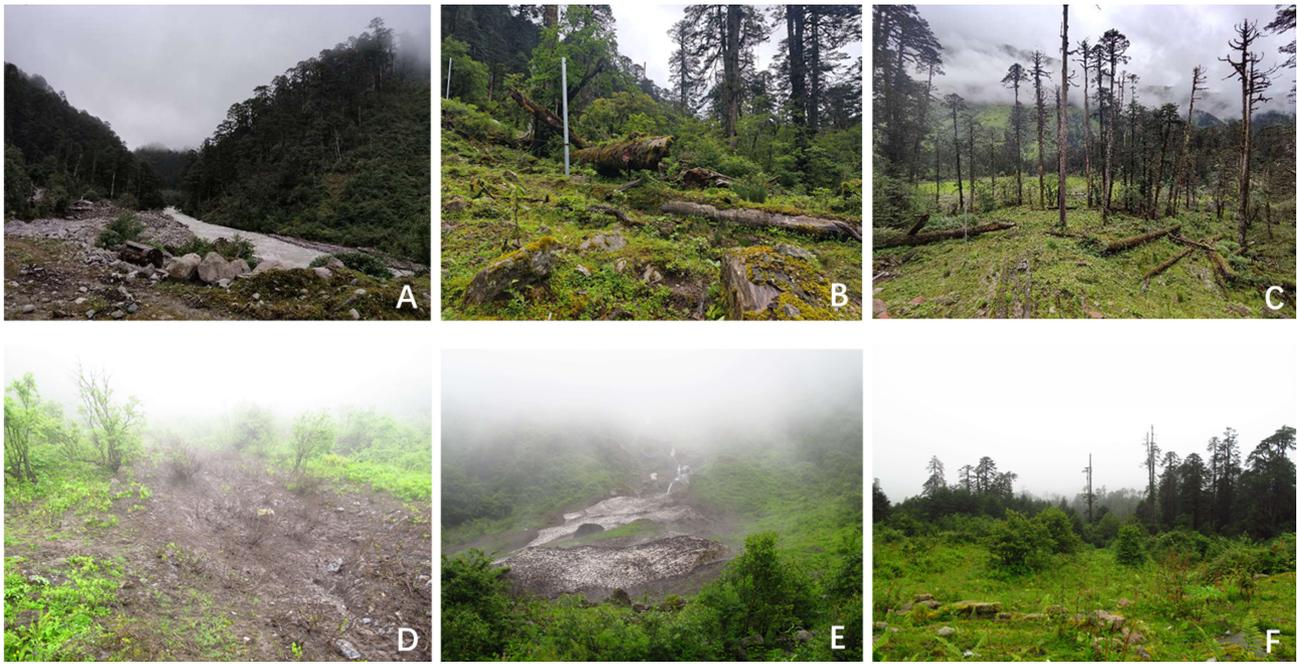


FIGURE 12. Distribution of Pterostichini species in Mêdog. All confirmed distributions from China are marked.



**FIGURE 13.** Habitat of *Medogia* gen. nov. Mèdog County in southeastern Xizang, China (type locality). **A–C.** Habitat of *Medogia mirabilis* sp. nov. (holotype). **A.** 61 km on Mèdog Rd. Xirong valley. **B–C.** 63 km on Mèdog Rd., near Ramko hotel. **D–F.** Habitat of *Medogia melanaria* sp. nov. (holotype), Baibung Town, Lage.

***Pterostichus (Bothriopterus) aeneocupreus* (Fairmaire, 1887)**

Fairmaire 1887: 95. (original: *Platysma*; type locality: Yunnan). Tschitschérine 1900: 612 (precedence fixed as first reviser). Andrewes 1937: 3. Straneo 1983: 210.  
*yunnanus* Fairmaire, 1887: 94, (original: *Platysma*; type locality: Yunnan). Tschitschérine 1900: 612 (as *Platysma aeneocupreum* var. *yunnanum*). Jedlička 1962: 214.  
*kanssuensis* Tschitschérine, 1889: 194, (original: *Bothriopterus*; type locality: Gansu). Tschitschérine 1900: 612 (synonymization established).  
*smaragdinus* Straneo, 1982: 140, (original: *Pterostichus*; type locality: Bhutan). Schmidt *et al.* 2009: 132 (synonymization established).

**Examined specimens from Mèdog County.** 5 exx. (IZCAS), “China, Xizang, Mèdog, Zhamo-Mèdog road, 62 km, N29.70753, E95.57735, 2885 m, 2017.8.6D, Liang Hongbin coll.”. 1 ex. (IZCAS), “China, Tibet, Mèdog, 61 km from Bomi to Mèdog, under rocks, 29.70376N, 95.56912, 2765 m, 2006.8.26 day Liang H.B. coll.”. 1 ex. (IZCAS), “China, Tibet, Mèdog, 80K, N29.65793, E95.48988, 2050 m, 2016.6.15D, Liang H.B. coll.”. 1 ex. (IZCAS), “Dayandong-Nage Motuo Coun. Xizang A.R., alt. 2900-3300, 28-VIII-2005, Tang Liang leg.”. 21 exx. (IZCAS), “China, Tibet, Mèdog county, Baibung, Lage, N29.4672, E95.0011, 3220 m, 2015.8.8, Liang H. B. leg.”. 1 ex. (IZCAS), “China, Tibet, Mèdog, Baibung, E Doxong pass, Lage hotel, in leaf litter, 29.46751N, 95.00232E, 3210 m, 2005.8.11, Zhou DK, Huang H”. 2 exx. (IZCAS), “China, Tibet, Mèdog, Baibung, E Doxong pass, under rocks along trail, 29.49009N, 94.95566E, 4074 m, 2006.8.7 day, Liang Hongbin coll.”. 1 ex. (CBFU), “Xizang, Mèdog county, along Zhamo road, 2023.7.6, 3440 m, 29°44’20.40”N, 95°40’57.87”E”.

**Remarks.** This is the most common *Pterostichini* species in Southwest China, abundant across nearly all mid-to-high altitude regions. In Mèdog, it tends to inhabit open habitats at elevations of 2,500–4,000 m.

## Key to species of Pterostichini from Mêdog

1. Dorsum distinctly metallic ..... 2  
- Dorsum entirely black ..... 5
2. Pronotum and elytra similarly colored; elytral odd interval slightly wider than even ones; pronotal lateral margins more or less crenulate; metaepisternum slightly longer than basal width, hind wings reduced ..... *Medogia mirabilis* Wang & Shi **sp. nov.**  
- Pronotum and elytra differently colored; elytral intervals of similar width; pronotal lateral margins not crenulate; metaepisternum distinctly longer than basal width, hind wings well-developed ..... 3
3. Antennomere 1 subequal to combined length of antennomeres 2–4; terminal labial palpomere triangular; elytral parascutellar pore present; elytra purplish black ..... *Trigonotoma indica* Brullé  
- Antennomere 1 much shorter than combined length of antennomeres 2–4; terminal labial palpomere fusiform; elytral parascutellar pore absent; elytra red or coppery red ..... 4
4. Smaller species, body length 9–12 mm; pronotum with punctures on basal foveae; third interval of elytra with setigerous pores; metatrochanters without seta; fifth tarsomeres without seta ventrally ..... *Pterostichus aeneocupreus* (Fairmaire)  
- Larger species, body length 15–17 mm; pronotum base impunctate; third interval of elytra without setigerous pores; metatrochanters with one seta; fifth tarsomeres with setae ventrally ..... *Nirmala odelli* Andrewes
5. Elytral odd intervals much wider and more strongly elevated than even ones; terminal labial palpomere narrowly triangular, widest at apical margin; fifth tarsomeres with setae ventrally ..... *Lesticus bii* Zhu, Shi & Liang  
- Elytral intervals equally elevated, odd intervals at most slightly wider than even ones; terminal labial palpomere fusiform or slightly expanded near middle, widest near middle; fifth tarsomeres without seta ventrally ..... 6
6. Pronotum strongly narrowed towards base, PBW subequal to HW; glossal sclerite with four setae on anterior margin; elytral parascutellar pore absent; male sternite VII not modified ..... *Medogia melanaria* Shi & Wang **sp. nov.**  
- Pronotum slightly narrowed towards base, PBW much greater than HW; glossal sclerite with four setae on anterior margin; elytral parascutellar pore present; male sternite VII modified ..... 7
7. Larger and robust species, body length 17–19 mm; head and pronotum distinctly wrinkled; third interval of elytra without setigerous pores; male sternite VII with longitudinal ridge ..... *Pterostichus rugosiceps* Schmidt  
- Smaller and slim species, body length 10–12 mm; head and pronotum at most very faintly wrinkled; third interval of elytra with two setigerous pores; male sternite VII shallowly ..... *Pterostichus medogensis* Shi & Wang **sp. nov.**

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## Author contributions

The first author (YNW) first proposed the new genus *Medogia* and the new species *Medogia mirabilis* in her master’s dissertation, generated all the gene sequences used in this study, performed the phylogenetic analysis, contributed the text for the “Taxa and sequences” section, and prepared Fig. 5, 7A, B, C, D, E, F. The second author (HLS), who shares first authorship, conceptualized the article, conducted morphological observations, comparisons and descriptions, and compiled most of the manuscript and illustrations unless otherwise specified. The third author

(HBL) supervised the research, reviewed the final manuscript version, conducted long-term field surveys in Mêdog and other regions of southern Xizang, and collected most specimens used in this study.

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## 西藏墨脱通缘步甲族Pterostichini新属种记述（鞘翅目：步甲科）

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**摘要:** 对墨脱县通缘步甲族Pterostichini分类学开展研究, 描述1新属3新种, 即秘步甲属*Medogiagen.nov.* (模式种: 奇秘步甲)、奇秘步甲*Medogia mirabilis sp. nov.* (模式产地: 墨脱县62K, 2794 m)、黑秘步甲*Medogia melanaria sp. nov.* (模式产地: 墨脱县拉格, 3270 m) 和墨脱通缘步甲*Pterostichus (Circinatus) medogensis sp. nov.* (模式产地: 墨脱县62K, 2794 m); 分子系统学分析亦佐证了新属有效性。该族墨脱县分布8种, 犁通缘步甲*Pterostichus (Pseudethira) rugosiceps*和妮步甲*Nirmala odelli*为墨脱新纪录种; 首次提供犁通缘步甲雄性外生殖器描述及图片。

**关键词:** 步甲; 麦步甲属复合群; 分类学; 系统发育; 喜马拉雅山脉